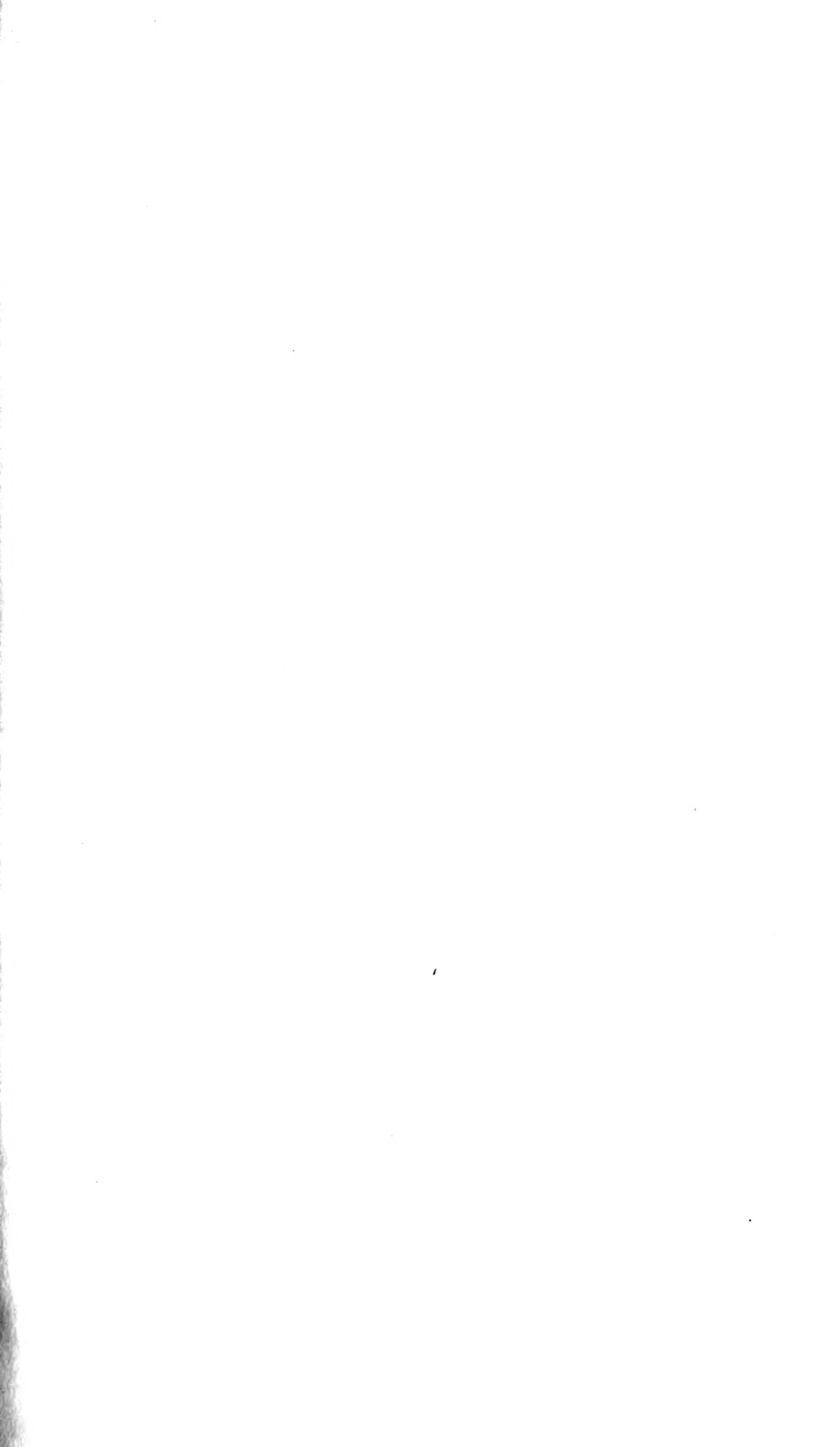


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Annals of Otology, Rhinology and Laryngology

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VOL. XVI, 1907.

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ANNALS
OF
OTOLOGY, RHINOLOGY
AND
LARYNGOLOGY.

VOL. XVI.

MARCH, 1907.

No. 1.

I.

THREE CASES OF LABYRINTHINE SUPPURATION
COMPLICATING PURULENT OTITIS MEDIA.*

BY EDWARD BRADFORD DENCH, M. D.,

NEW YORK.

Suppuration of the labyrinth is a subject which has attracted more and more attention on the part of the otologist during the past decade. Owing to the fact that the labyrinthine fluid is separated from the tympanum only by the foot-plate of the stapes and by the comparatively thin membrane of the round window, it seems rather surprising that invasion of the labyrinth is not more frequently reported as a sequel of chronic middle-ear suppuration. Unquestionably, the labyrinth is more frequently involved in a suppurative process than the records of most otologists show. Our attention has been drawn to this complication of purulent otitis media chiefly in connection with fatal cases, and from the fact that in quite a large proportion of fatal cases—especially in those instances where death has fol-

*Read before the Eastern Section of the Amer. Laryngological, Rhinological and Otological Society, at Providence, R. I., January 5, 1907.

lowed as the result of cerebellar abscess—the path of invasion has been traced directly from the middle ear, through the labyrinth, through the internal auditory meatus, to the cerebellum.

Quite frequently, a suppurative inflammation of the labyrinth is found at the time of operation, although, from the clinical history, the condition could not have been diagnosed prior to the operation. In other instances, however, there is a distinct history, which should lead the operator to suspect labyrinthine involvement.

In the cases about to be reported, such a clinical history was given in one case. In two others, the labyrinthine involvement was found at the time of operation, there being no suspicion on the part of the operator, at the time surgical interference was advised, that such a condition existed.

The first case was that of a young man of 31 who presented himself at the New York Eye and Ear Infirmary, with a history of chronic suppurative otitis media, which had lasted for a period of years. Within the two weeks before the patient came under observation, he had suffered from severe vertigo and headache. The vertiginous symptoms had been steadily increasing. The case was reported to me simply on account of the chronic suppuration, and the consequent indication for relief by a radical operation. After obtaining the history, I expressed the opinion that we should very likely find suppuration of the labyrinth. The radical operation was performed in the usual way. When the horizontal semicircular canal was exposed, a carious area was found which involved the entire thickness of the canal wall. Curettage easily opened the lumen of the canal. This opening was enlarged until the lumen of the bony canal could be distinctly seen. The carious canal wall was cautiously removed forward to a point just above the oval window. The crura of the stapes were carious. The stapes was removed, and the entrance to the oval window was enlarged. In this way, free drainage of the vestibule was obtained. A narrow strip of iodoform gauze was inserted into the oval window, and was also made to cover the opening in the horizontal semicircular canal. The entire radical cavity was then packed with iodoform gauze, and the wound sutured. An uninterrupted recovery took place in this case, and the vertigo entirely disappeared after the operation. In this instance, invasion of the labyrinth undoubtedly took place through the horizontal

semicircular canal. The involvement was so extensive, that it seemed wise to the operator not to rely upon drainage of the carious area alone, but to secure complete drainage of the labyrinth by removal of the stapes, thus securing drainage of the vestibule. The complete recovery of the patient seemed to justify the operative procedure. Two months after the operation, the acoumeter was heard at 6 inches, in the affected ear, and the forced whisper at 18 inches. There was still a slight odorless discharge from the canal.

The second case was that of a boy, aged 14, who had been suffering from a chronic suppurative otitis media, involving the right ear, for a number of years. There had been no symptoms indicative of labyrinthine involvement. On performing the ordinary radical operation, an eroded area was found, leading into the horizontal semicircular canal. The outer wall of the bony canal was removed for a considerable distance, until the probe could be passed downward, forward and inward into the vestibule. A narrow strip of gauze was carried into the opening into the semicircular canal, the radical cavity packed with iodoform gauze, and the ordinary dressing applied. This patient made an absolutely perfect recovery. An examination of the case six weeks after the operation, showed the ear practically dry, there being but a slight serous discharge. The hearing upon the right side, for the acoumeter, was 1 foot, the forced whisper, 3 feet. It should be stated in this connection, that this boy was suffering from a double suppurative otitis media, and that the radical operation was also subsequently performed upon the left side; there was no labyrinthine involvement upon this side. Upon the left side, the acoumeter was heard at 6 feet, and the forced whisper at 9 feet. The tests of hearing made prior to operation were somewhat unsatisfactory, but in this particular case, seemed to indicate that the patient's hearing was considerably impaired, as the result of operation, particularly upon the right side, that is, the side upon which there was labyrinthine involvement.

Two other similar cases, occurring in children—one in an infant only a few months old—have also been operated upon within the past year, by the same method, and in each instance, recovery has been perfect. In the case of the young infant, ten weeks of age, an erosion of the horizontal semicircular canal was found complicating an acute otitis. Here, the radical operation was not performed. A simple mastoid operation was

done, and the eroded area on the outer wall of the external semicircular canal was curetted, opening the lumen of the canal. The wound was dressed in the usual way, care being taken to shut off the lumen of the canal from the remainder of the wound, by a strip of iodoform gauze packing. Complete recovery took place in this case. I cite this case simply to show at how early an age we may have erosion of the labyrinthine wall.

In the third case, that of a girl, aged 12, suffering from chronic middle-ear suppuration, with no symptoms of labyrinthine involvement, the radical operation was performed simply for the relief of the suppuration. Toward the end of the operation, the region of the oval window was found to be filled by granulation tissue. An attempt was made to remove this, and although the curette was used with the utmost gentleness, the stapes was extracted. The stapes apparently lay loose in the oval window and the foot-plate was considerably atrophied. The probe could be passed directly into the labyrinth. A strip of gauze was packed into the pelvis ovalis, and the radical cavity dressed in the usual manner. This patient had rather persistent nausea for forty-eight hours after the operation, but ultimately made a complete recovery. One month after the operation there was only a very slight amount of discharge from the ear, and the acoumeter was heard at 3 feet on the affected side, the forced whisper at 3 feet.

These cases are reported to show the frequency with which the labyrinth may be involved. The three cases specifically cited occurred during my last twenty-eight radical operations. From the history of these, we find that there are two avenues by which the labyrinth may be invaded: The first and most common, through the bony wall of the horizontal semicircular canal, and second, directly through the oval window. It is a question in my own mind as to whether, in many of the cases where we have suppuration after a complete radical operation, we have not to do with a suppuration of the labyrinth. All who have performed many radical operations, must have been impressed with the fact of how frequently we find granulation tissue in the pelvis ovalis. Many of us rather hesitate to interfere with granulation tissue in this neighborhood, for fear of extracting the stapes. I am inclined to believe that we have been rather too conservative in this direction. Granulation tissue about the stapes should be treated the same as granula-

tion tissue in any other part of the tympanic cavity, and if it is necessary to remove the stapes in order to free this portion of the tympanum from granulation tissue, the stapes should be removed. Naturally, if there is no evidence of suppuration of the labyrinth after removal of the stapes, the oval window should not be enlarged, and the operator should content himself by simply shutting off the pelvis ovalis by means of a gauze drain, to prevent involvement of the labyrinth through the middle ear. If, however, pus is seen to flow from the oval window, the oval window should be enlarged forward and downward, so as to completely drain the vestibule. In those cases where the horizontal semicircular canal is the site of the invasion, the procedure will depend upon the extent of the labyrinthine involvement. If no pus flows from the semicircular canal, after the opening is enlarged, and if no granulations are present about the oval window, the operator may content himself simply by draining the labyrinth through the horizontal semicircular canal, and from the cases which have come under my observation, I can say that he will feel fairly certain of eradicating the labyrinthine involvement by this method. If, however, there seems to be extensive involvement of the labyrinth, the opening of the semicircular canal alone, will not suffice. After the canal has been thoroughly drained, the stapes should be extracted, provided its foot-plate is in position, and the oval window should be enlarged downward and forward, so as to freely drain the vestibule.

The cases reported are also interesting as showing the effect of interference with the labyrinth, on the power of audition. In all of the cases the hearing was made considerably worse, as one would naturally expect. For this reason, therefore, the surgeon should avoid opening the bony labyrinth, unless he is absolutely certain that disease exists in this region; in other words, it should not be opened either through carelessness or for purely experimental purposes, as drainage, even of the semicircular canal will probably cause some impairment in the hearing, owing to the change which it causes in labyrinthine pressure. At least, this seems to have been the result in my own cases.

Regarding the advisability of extracting the stapes, I naturally believe that the stapes should be left *in situ*, in performing the radical operation, unless the pelvis ovalis is so filled with granulation tissue that it is impossible to clear this away with-

out removal of the ossicle. In cases where the ossicle comes away during cautious curettement of the oval nitch, we will always find, probably, that the stapes is diseased. The cautious extraction of a healthy stapes should cause practically no interference with audition, as has been proven in many cases where the stapes has been removed either intentionally or accidentally during an ossiculectomy. If granulations are found in the oval window, and upon curettement the stapes comes away, the operator should pass a delicate probe into the pelvis ovalis, to determine whether the oval window still remains closed by fibrous tissue, or whether the probe can be introduced directly into the vestibule. Naturally, the utmost gentleness must be used in conducting this manipulation, as otherwise, the membrane of the oval window might be ruptured, and infection of the labyrinth take place at the hands of the operator. If the vestibular membrane is found to be ruptured, I do not think it wise to enlarge the oval window, unless pus can be actually seen coming from the labyrinth. If the removal of the stapes shows a suppuration of the labyrinth, that is, if pus flows from the oval window after the stapes has been removed, enough of the external labyrinthine wall should be removed to afford free drainage. This is best done by the cautious use of a slender gouge and small curette, enlarging the oval window downward and forward. In other words, removing the promontory and destroying the first turn of the cochlea.

Still freer drainage can be obtained in these cases by removing the external wall of the horizontal semicircular canal as well, and this, I believe, should be done in cases where the labyrinthine involvement is extensive.

When the external semicircular canal and the vestibule are both open, the operator must remember that it will be impossible to break down the bony wall completely between these openings without destroying the facial nerve where it runs above the oval window. There is no necessity, however, for breaking down this small bony wall. The wall of the external canal can be removed cautiously as far as the aqueductus Fallopii, the thin bridge of bone, lying just above the oval window, and containing the facial nerve, being allowed to remain. The presence of this ridge does not in the least interfere with drainage.

17 West 46th Street, New York.

DISCUSSION.

DR. EAGLETON: Dr. Dench spoke of two of his three cases as being cases in which there was no suspicion of the labyrinth being involved. During the last two years we have had at the Eye and Ear Infirmary seven cases of labyrinthine suppuration. About a year ago I had an occasion to read an article by Stearn of St. Petersburg, before the Congress of Bordeaux, in which he calls attention to the disturbance of the equilibrium in labyrinthine suppuration. He speaks of the indifference of patients suffering with labyrinthine suppuration and the varying delicate movements in coordination, but he chiefly calls attention to the fact that those patients are not able to execute the hopping movement. He has his patient bring his feet together and hop with both feet together. In some cases the patient is absolutely unable to hop; while in all cases, as I judge from the article, if their eyes are closed, they hop one or two steps, and some fall. The majority don't hop with that degree of certainty that a normal person does. Since reading this article we have been able to diagnosticate three cases of labyrinthine suppuration that had no other symptoms. They were unable to execute the delicate movements of coordination that Stearn calls attention to. In my practice, in every case of chronic otorrhea, the patient goes through those movements as a part of the examination.

DR. JOHN D. RICHARDS: During the past few years I have had nine cases of labyrinthine invasion, five of actual suppuration and four in which there was a necrosis of various parts of the labyrinth. The usual place of infection, in these cases, has been through the horizontal semicircular canal, and in one instance there was an extension through the first coil of the cochlea; in another instance through the oval window, and another instance there was perforation through the capsule leading down into the vestibule, the perforation being immediately above the semicircular canal. All these cases were operated upon and in a large portion of them they showed no symptoms whatever, that is, there were no symptoms calling special attention to labyrinthine invasion, but simply that they were victims of chronic suppuraive otitis. In one of the cases in which the arches of the semicircular canals, the cochlea and the vestibule were removed and only the ampullary areas of the canals were left, the patient heard all of the Hartmann set forks and the thirty-five thousand Koenig's rod. There is, as a rule, in the case

where the labyrinth is involved, a tendency to fall towards the opposite side from that involved. In regard to the statement made by Dr. Dench as to the removal of bone extending from the oval window downward and forward, I don't think, in those cases, that we can confine our operative procedure to such definite limits. When the vestibule was invaded, the cases which I have seen have had the cochlea invaded also. The hopping which Dr. Eagleton speaks of I have tried in several cases in which the internal ear has been involved. The patient hops and upon lighting then falls to the side opposite to the side of involvement. In one instance I had an acute suppuration of the labyrinth which followed an acute mastoiditis. An operation was performed, and there was found a perforation through the inner wall of the vestibule, around the origin of the internal auditory meatus. An epidural cerebellar abscess was present and the disease had invaded the petrous portion of the temporal bone requiring an exenteration of the petrous. In regard to avoiding injury to the facial nerve, which is a question we have got to consider in cases in which the internal ear is involved, I would say that the facial nerve is secondary in importance, but we can, as a rule, avoid injury to it by preserving a gutter of bone or arch for the nerve to run in, extending from the internal auditory meatus down to the lower portion of the facial ridge. In one of these operations a little incident occurred which shows how unexpected difficulties may arise. In removing the external wall of the Fallopiian canal a little annulus or ring of bone separated by cleavage and encompassed the nerve. It was very difficult to get hold of and to separate from the nerve without injury to that structure and it makes an exceedingly annoying complication. Paralysis of the facial nerve always occurs when that nerve is exposed throughout its circumference. If the nerve is not injured, that is, not cut across, we will, as a rule, get almost complete recovery in about four months. Every case that I have operated upon, in which the entire labyrinth has been removed, has shown facial paralysis and every one of them has recovered to a great extent the function of the nerve at the expiration of from four to five months. In no instance was the nerve injured, except through its exposure.

DR. WENDELL PHILLIPS: So far as I can recall the cases that I have observed, where I have been positive that there was suppuration of the labyrinth present even to a small degree, I

have been able to get a history of vertigo. I would like to ask Dr. Dench, or any one else, if he ever failed to get that sign. It has always been present. Sometimes the patient might not mention it, but by going carefully into the case I have been able to get that symptom. I have never tried the experiment Dr. Eagleton has mentioned, but I am inclined to think that you may try that experiment on a great many comparatively well people and you would find that they could not make over three hops without falling down. I imagine if Dr. Eagleton would try that himself he would pretty nearly get that result.

DR. EAGLETON: In regard to Dr. Phillips' remark I will say that I have had many hundreds of people hop during my connection with the Newark Eye and Ear Infirmary. In cases of chronic suppuration the hopping is part of the routine. The last case that I had will illustrate. When I saw the man I said, "This man has labyrinthine suppuration, I am very sure." Twice previous I had felt moderately sure. The last time I felt positive. It was as the result of observing previous cases. What Dr. Phillips says is true concerning one or two hops with the feet together, I think, when there is a game leg, that they feel a little wobbly. A normal man hops with a degree of assurance. The first time he may fall down but after he has done it once or twice he begins to hop with a degree of assurance, while one suffering with labyrinthine suppuration never has that nor can he acquire it. It is a diagnostic point that in my personal experience is attended with the greatest of value in looking for the inability to execute certain coordinate movements.

DR. RICHARDS: In cases which have come on with fair rapidity, vertigo, in my experience, has been present. Cases that have come on gradually are evidenced by the fact of chronic suppuration in the labyrinth, but the invasion has been so insidious that absolutely no symptoms whatever could be observed except that in some instances there has been slight nystagmus, and in one instance in which the entire labyrinth was obliterated, the patient was some weeks later sitting in a room where a piano was being played. He said it caused such dizziness that he fell over, and for some weeks he could not hear music without having vertigo.

DR. DENCH: In reference to Dr. Phillips' remarks, in certainly one-third of the cases there has been no vertigo at all. The experiment of which Dr. Eagleton speaks, I have never tried.

With reference to what Dr. Richards says concerning the facial nerve, in cases where there is very extensive involvement, of leaving a small ridge of bone, I make mention, in my paper, I think, of the desirability of preserving the integrity of the facial nerve except in those cases where you have very considerable destruction of the labyrinth. If you practically take away the entire petrous and temporal bone the facial nerve will suffer. In a good portion of the cases, you can drain your labyrinth thoroughly without sacrificing the integrity of the facial nerve.

II.

CLINICAL VALUE OF THE DIFFERENTIAL BLOOD COUNT IN A CASE OF ACUTE BRAIN DIS- EASE AND IN A CASE OF ACUTE DOUBLE MASTOIDITIS.

By W. P. BRANDEGEE, M. D.

NEW YORK.

In presenting for your consideration the report of these two cases, one of temporo-sphenoidal abscess, and the other of acute double mastoiditis, I realize fully that they are of but little value as conclusive proof. I offer them rather as illustrative and typical cases where all those classical symptoms are present which call for operative interference, and as instructive cases, especially in the light of the different findings of the examination of the blood, and in particular the varied polynuclear percentages which we are now taught to believe indicate the presence of pus and the severity of pus infection. It is not within the province of this paper, although the temptation is great, to discuss the various methods of blood examination, the composition, formation or changes of blood cells or the deductions therefrom, in so far as they may influence the general economy, but to call attention specifically to the clinical value of the differential blood count in these suppurative cases.

Max Einhorn, in a thesis written in Berlin, in March, 1884, calls attention to the fact that in puerperal sepsis he found that the normal percentage of lymphocytes was diminished and that the polynuclear percentage was higher than normal; but in his article, he gave no reason for the two conditions coexisting, nor did he draw any conclusion therefrom—a fact was simply stated.

F. E. Sondern, however, in several interesting papers, notably one read before the Surgical Section of the Academy of Medicine in New York, on February 3, 1905, is the first one to make clear to the surgeon the meaning of the differential blood count and to present firm, clear-cut opinions as

the result of long and careful investigation. Sondern makes three strong statements:

First.—"A relative percentage of polynuclear cells, below 70, with an inflammatory leucocytosis of any degree, excludes gangrene or pus at the time the blood examination is made, and usually indicates good body resistance toward infection.

Second.—"An increased relative percentage of polynuclear cells, with little or no inflammatory leucocytosis is still an absolute indication of the inflammatory process, and the polynuclear percentage is a direct guide to the severity of the infection.

Third.—"An increased relative percentage of polynuclear cells with a decided inflammatory leucocytosis is an accurate guide to the status of the inflammatory lesion."

These are clear, strong conclusions certainly, and, coming from an observer of standing who supports his arguments with a tabulated list of over 1700 cases, demand the attention and consideration of those interested in aural surgery.

Sondern further tells us that in the healthy adult of the middle or upper classes a normal leucocytosis in 1 cmm. of blood in 1 to 100 dilution averages about 6700; while a normal polynuclear neutrophile percentage averages about 62 per cent.

There are other observers, notably the Germans, who differ as to these normal averages, some, indeed, claiming a hypo-leucocytosis of 25,000 to 30,000 necessary in order to indicate pus.

Ewing, in his work on the Clinical Pathology of the Blood, states that Ehrlich's figures may serve as a standard for healthy adults, viz., lymphocytes 22 to 25 per cent and a polynuclear neutrophile count of about 70 to 72 per cent to the 1 cmm. of blood.

Again, Limbeck, in an article published in 1889, asserts that an 80 per cent polynuclear count is well within normal limits, while T. W. Hastings in his brochure on Blood Terminology considers the polynuclear count of from 60 to 75 per cent and a leucocytosis of 7500 standard.

Despite these variations made by different observers in the normal blood count, it may be fairly established that for clinical purposes a leucocytosis of from 6000 to 10,000 and polynuclear count of from 58 to 70 per cent may be taken as a basis for comparison.

In a paper read by C. L. Gibson before the Surgical Society of New York a few weeks ago, the author distinctly asserts his belief in the clinical value of the differential blood examinations in pus infection, although in some few cases it had failed him establishing a diagnosis. He proposed a chart which should picture the relative infection of a given case by means of slanting lines drawn from the highest point of leucocytosis to the high point of polynuclear percentage, the difference in the pitch of these slanting lines denoting the severity of infection. For us, however, who have to deal with infective cases, the clinical value of a differential blood count rests on two proven facts: First, that a relatively high leucocytosis means a relative body resistance and that a relatively high polynuclear percentage means a relatively severe pus infection.

Admitting then these two conclusions, immediately we are brought face to face with the fact that in some instances the laboratory findings do not agree with the clinical picture of our acute aural suppurative cases.

The question then arises as to whether we are to disregard these differential blood counts and depend entirely upon clinical observation and experience, or despite a severe inflammatory condition, depend solely upon our laboratory reports. I would bring to your notice:

Case I.—On July 1, 1905, I was called upon to take charge of J. R., a Cuban, 16 years of age, who had undergone on June 22, 1905, a radical operation, with primary skin grafting for chronic suppurative condition of the left ear, which had existed on and off for over eleven years. The wound at this time was doing well in every way, there being only a slight muco-purulent discharge, while the skin grafts had apparently effected union with the exposed open area. At the time of his operation, there had been exposure of lateral sinus or dura.

From the day I first saw this case, the middle ear cavity was dressed daily through the external cavity and the posterior line, which had broken down four days after operation, was also dressed with iodoform gauze and a fairly large mastoid dressing was applied.

The condition of the wound improved daily until July 15th, when the patient was discharged from the hospital, to report to the office for further local treatment. During the

period of July 4th to 15th, it had been noticed that his pulse had been rather slow, ranging from 60 to 70; that he had had several attacks of nausea and vomiting, which were never at any time serious, and were thought to be due to slight bilious attacks or indigestion, and that the patient was irritable, in sharp contrast to what he had been before the operation. The patient's appetite was not good and he complained of feeling weak, while the temperature varied from normal to 99 and 99½ degrees. The patient had been up and dressed and had taken several walks and drives during his last week at the hospital. For the next three or four days after leaving the infirmary, he complained of some frontal headache, continued general weakness and lack of appetite. It was also observed at this time that irritability was increasing. On July 20th, Thursday, he became nauseated, the headache became persistent and he was obliged to remain on his couch most of the day. His temperature during this interval was normal, but his pulse ranged from 60 to 68.

On July 21st, Friday, there was persistent vomiting which could not be controlled. He was drowsy all the time, his speech was not connected and articulation was not perfect.

On Saturday, July 22d, the temperature suddenly went to 102.2°, pulse rate was still slow, about 64, the vomiting was continuous and the mental condition was worse.

On Sunday, July 23d, all his symptoms were exaggerated and the temperature rose to 104.2°; sensory aphasia now developed, and all reflexes were diminished. A consultation was held, immediate operation was advised and the patient was returned to the hospital in an almost comatose condition.

Under chloroform anesthesia, an incision was made in the line of the old scar behind the ear, and both flaps retracted. The cavity of the old mastoid wound was cleared of all granulations, and of what appeared to be skin grafts, then thoroughly cleansed and explored. Necrotic bone was found over the tegmen tympani, and through this the probe led to dura. The mastoid tip was discolored and remained intact.

An incision was now made through the posterior flap at right angles to it and backward for about two inches. The mastoid tip was first ablated and the lateral sinus, which had been exposed by this procedure, was found to be discolored and collapsed. The sinus was removed from the bulb to

near the torcular end, before normal blood flow was established, and was then packed off by iodoform gauze.

Attention was now directed to the exposure of the temporo-sphenoidal lobe. An opening about the size of a 50-cent piece was made through the bone at the usual site for such exploration, and disclosed a slightly congested dura. Three silk sutures were introduced through the dura and a horizontal incision of about an inch and a quarter was made over them, dividing the dura. There was but slight intracranial pressure. A long thin-bladed knife was then introduced into the brain substance in a direction forward, inward and upward, but no pus followed the knife. A second puncture forward, inward and downward was immediately followed by the discharge of a quantity of thin yellow odorless pus. A Whiting encephaloscope was carefully introduced and a large abscess cavity, having no lining wall and filled with pus and necrotic brain tissue, was found.

After this cavity had been wiped clean, a cigarette drain composed of gauze saturated with equal parts of powdered boric acid and iodoform, was inserted. The silk sutures in the dura were removed and the usual dressings were applied. About one ounce of pus escaped from this abscess cavity, and the laboratory report showed the infection to be due to *staphylococcus albus*.

On the third day following operation, the aphasia and the nausea had disappeared, the patient was able to retain some nourishment, the pulse was stronger and the temperature had come down to 99. From this time on, the boy gained daily, the pulse rate increased to 88, while the headaches had entirely disappeared and appetite had returned.

The entire wound was dressed daily, especial care being taken in the manipulation of the brain cavity from which all packing was removed on August 17th—the 25th day after operation.

The boy was discharged from the hospital on September 5th, practically cured. Six differential blood counts from this patient were made between July 5th and August 16th, and they show positively the onset, the crisis and the decline of this secondary infective process.

They are as follows:

July 5—Red cells,	5,000,000
Leucocytes,	12,600
Polynuclear cells,	66%
July 10—Red cells,	4,840,000
Leucocytes,	10,600
Polynuclear cells,	61.26%
July 22—Red cells,	4,656,000
Leucocytes,	15,100
Polynuclear cells,	76.75%
July 23—Red cells,	4,500,000
Leucocytes,	15,000
Polynuclear,	83%
July 30—Red cells,	3,056,000
Leucocytes,	6,010
Polynuclear cells,	61.8%
August 16—Red cells,	3,230,000
Leucocytes,	6,000
Polynuclear cells,	52.8%

It will be noticed that in the blood counts taken on July 5th and 10th, the leucocytosis was rather high, and this was due undoubtedly to the effort at healing, but on both these the polynuclear percentage was normal.

In the blood counts of July 22d and 23d, we find a relatively high leucocytosis and rapidly increasing septic invasion, as shown by the polynuclear percentages for those dates.

Again, the blood examination of July 30th and August 16th, show a return to normal conditions. In this case, all the clinical symptoms pointed certainly to a brain infection.

The polynuclear examinations gave us a relatively higher percentage as time passed, confirming our diagnosis of a new pus formation and the increasing severity of the infection, and warned us clearly of the time for operative interference, while our leucocyte count kept us informed as to the bodily resistance of the patient. Valuable information, indeed, and clinical medicine and laboratory were in thorough accord in this case.

In contrast to this picture, allow me to report:

Case No. 2—On the evening of December 23, 1905, I saw, in consultation, M. H., a boy 12 years of age. He had been suffering from a cold for a week, and for the last two nights had complained of such severe pain in both ears that sleep

had been impossible.

The boy was extremely nervous and was suffering intensely. The temperature, by mouth, was 103° , the pulse was 122 and of fair volume.

On aural examination of the right ear, the posterior superior canal wall was found to be bulging, highly injected, and prolapsed so that the drum membrane could not be made out, and there was no discharge present in the external auditory canal. The slightest pressure over the right mastoid antrum caused intense pain, and there was likewise some tip tenderness. Movement of the cartilaginous canal elicited no pain.

In the left ear, the speculum revealed practically the same conditions, although not quite so marked, while pressure over the bone developed tenderness over the left antrum and tip.

The patient was taken to the New York Eye and Ear Infirmary, and under nitrous oxid anesthesia, myringotomy was done on the right side. A specimen of the discharge which followed the incision was sent to the laboratory for examination. A bichlorid solution of a strength 1 to 5000 was ordered for aural irrigation every two hours, the patient was put to bed, a cathartic was given and fluid diet ordered. The boy slept fairly well that night, but the pain increasing in the left ear on the following day, it became necessary to incise the left drum membrane. A very purulent discharge followed this incision, and a specimen was taken for examination.

The report from the laboratory showed that streptococci were present in large numbers in both smears, and it may be stated here that the same report was returned from the laboratory on the smears, taken for the eight days following.

The patient slept fairly well after free drainage had been established, but the antrum pain was exaggerated on both sides and the temperature remained high, 102° .

On December 26th, the first differential blood count was made, and confirmed my opinion that an operation was imperative.

On the two following days—December 27th and 28th—the clinical symptoms did not improve and the polynuclear percentages increased, but having my patient under perfect control and determining to test fully the value of the blood

count, I decided to postpone operation. All preparations were made, however, for an operation on December 29th, as I expected the next differential count would show still further polynuclear increase, but, to my surprise, despite the severity of the clinical symptoms, the polynuclear percentage fell from 77 to 65.9 per cent, and the operation was again postponed.

On December 31st, all the local symptoms began slowly to clear up, the general condition improved and the mastoid tenderness began gradually to disappear. The temperature, which during the week, had been fluctuating daily between normal and 102.5°, a typical septic curve, fell to almost normal, and the patient was discharged from the hospital, without operation, on January 6th, 1906. Both ears still discharged.

The following are the results of the leucocyte counts:

December 26—Red cells,	5,010,000
Leucocytes,	19,400
Polynuclear cells,	71.8%
December 27—Red cells,	5,000,000
Leucocytes,	19,500
Polynuclear cells,	75.%
December 28—Red cells,	4,980,000
Leucocytes,	16,000
Polynuclear cells,	77.5%
December 29—Red cells,	4,970,000
Leucocytes,	13,000
Polynuclear cells,	65.9%
December 31—Red cells,	4,600,000
Leucocytes,	11,700
Polynuclear cells,	68.8%

In examining these blood counts, it will be observed that the patient had an increasingly high polynuclear percentage and a fairly high leucocytosis for the first three days in which specimens were taken, but the polynuclear percentage was not high enough to warrant surgical interference at any time, despite the clinical symptoms.

Here, indeed, we have beyond doubt from a clinical standpoint, a typical picture of acute double mastoiditis. Note, if you please, the period of aural involvement, the bulging and highly injected drum membrane, the prolapse of postero-superior walls, the marked pain on slight pressure over both

antra and tips, the temperature, the character of the infection, the sleeplessness and the general habitude.

The clinical picture and the laboratory were at marked variance in this case. But here the laboratory was right, and the patient made a complete recovery without any loss of function.

There are many objections to a laboratory diagnosis. I am well aware of the fact that there are those who strongly believe that, surgically speaking, they would much prefer to be sure of their ground from the viewpoint of a mastoid cavity than to leave by any chance a focus of infection which may need later on a more serious surgical operation, and it must be confessed that the position is well taken.

Again, John B. Deaver, in the *Medical News*, 1902, warns us thus:

"In the last few years there has crept into the profession the tendency to replace the bedside by the laboratory as a point from which to make a diagnosis. This we regret, for in the majority of instances, the diagnosis must be made at the bedside without the aid of the microscopist, and any man who has no confidence in diagnosis made without the aid of the laboratory, limits his usefulness."

It must be also borne in mind, that we may have to deal with acute infective cases which bear a fair analogy to the acute fulminating types of appendicitis where, to put it roughly, the blood is practically overwhelmed for the time by the inroad of the toxins and there is no blood reaction. In cases of this type, there may be no hypoleucocytosis, but we will invariably find even here a relatively high polynuclear percentage.

Again, only competent men should make a blood count in order that all sources of error may be eliminated through technical skill. One can easily see where faulty technic either in taking the specimen or in staining it, may be responsible for a wide variance in tests which may result seriously.

In searching for laboratory evidences of pus formation in or about the ear, in our acute cases, we must not forget, too, that a relatively high polynuclear percentage may indicate pus elsewhere in the body, or that in certain diseases—scarlet fever, erysipelas and pneumonia—these same high polynuclear percentages may exist, and that the disease itself may be the principal factor in the blood changes and the aural condition

only an insignificant complication. A process of elimination is often necessary if such conditions are present.

On the other hand, a straightforward, simple scientific fact should be trusted, despite the fact that it occasionally clashes with clinical medicine. I used the word "fact" advisedly in reference to differential blood examinations, because in not one instance, so Sondern declares, where such a count has been made correctly, has there been a failure to reveal pus where pus was present. As I said at the beginning of this paper, however, these two cases are simply illustrative and instructive.

In conclusion, I would say, that in every acute infective case where we have the patient under perfect control, and where a differential blood count can be readily obtained at the hands of a competent examiner, it is our plain duty to the patient and to ourselves as well, that such an examination should be made.

Moreover, in the light of recent investigation, we must be especially careful to place more emphasis on the relative polynuclear percentages than on a hypoleucocytosis, which, while interesting from a certain standpoint, does not indicate a pus formation or measure the severity of infection.

III.

REPORT OF A CASE OF DEFORMITY OF THE NOSE RESULTING FROM LUPUS; CORRECTED BY THE SUBCUTANEOUS METHOD.

BY JOHN O. ROE, M. D.,

ROCHESTER.

The following case of lupus of the nose is of interest on account of (1) the successful arrest of the disease after extensive destruction of tissue; (2) the marked deformity of the nose resulting from this loss of tissue and the cicatricial contraction; and (3) the subsequent successful subcutaneous correction of this deformity by the plastic method.

Mrs. E. A., of Minnesota, was referred to me by her family physician, November 27th, 1905, for the correction of her nasal deformity.

The history of the case is briefly as follows: Ten years ago she was attacked with lupus, the disease appearing at the same time on the face and on the right wrist. On the face the ulceration began as a patch under the right eye; later it extended to the lower portion of the nose and left cheek.

On the face and on the wrist the ulceration was superficial, confined entirely to the skin. but about the nose it extended deeply, involving the subcutaneous connective tissue, eating away a large portion around the end, extending up the sides, excavating both alae and giving the nose the appearance as if a portion had been literally bitten away by a wolf. The disease also extended into the nose, destroying the triangular cartilage.

The patient had been treated by her local physician with iodine and external cauterization, but without avail. She was then sent to Dr. Charles H. Mayo, of Rochester, Minn., who succeeded in arresting the disease by internal medication, consisting mainly, I believe, of guaiacol. After a considerable period the disease was arrested and, at the end of two years, entirely healed.

Two years later the patient was operated upon by a distinguished surgeon for the correction of the nasal deformity resulting from the lupus.

Under ether the doctor attempted to correct this deformity by a plastic operation, but was unsuccessful, the result being the complete obstruction of both nostrils, when cicatrization had taken place. Previous to this time she was able to breathe fairly well through her nose, but at the time I saw her both



Fig. 1.

nostrils were almost completely impervious to air, the only external communication being by a very small opening on the left side, near the upper part of the columna, through which a very slender probe could be passed.

On examination of the nose the end was seen to be cone-shaped, projecting downward, as shown in Figs. 1 and 2. There was a V-shaped contraction of the left ala, and a somewhat rounded contraction of the right ala, as seen in the illustrations. The triangular cartilage of the septum was

gone; the turbinates were small and the interior of the nose was quite capacious. The bony framework of the nose was normal. There was considerable scarring of the face where the lupus had attacked the skin (which may be seen in the illustrations).

In the correction of this deformity but one ala was operated upon at a time, the first operation being performed upon the right side. In performing this operation, a vertical incision



Fig. 2.

was first made so as to leave the central portion, the columna, of the normal width. The skin was then raised or dissected up, the incision being made on the inside of the nostril, to above the rounded mass of cicatricial tissue, on the right side of the nose, as shown in Figs. 1 and 2. A subcutaneous flap was then made of this mass of tissue which was turned down so as to fill in the defective portion and to form the normal contour of the ala. The skin was then sufficiently loosened to permit

it to be brought down or to slide down over this transplanted tissue, and permit the edge to be turned so as to form the border of the ala, and also to cover the denuded portion on the inside, in order that there should not be two opposing raw surfaces. The parts were carefully stitched in place, and an aluminum nasal tube introduced into the nostril, so as to maintain the normal size and shape until healed. When this side was



Fig. 3.

sufficiently healed the other side was operated upon in a similar manner, varied only by the slightly different conditions on this side, the redundant tissue at the end being utilized to fill in the gap in the left ala. After the skin had been raised, a flap was made of the redundant tissue in the end of the nose which was turned in to the gap in the left side, filling it completely.

A tube was also introduced into this nostril, and both tubes worn until healing was complete, leaving the nostrils in quite a normal condition, as will be seen by the Figs. 3 and 4, which show the condition of the nose after the operation. Two additional minor operations were necessary to remove inequalities



Fig. 4.

resulting from uneven healing, in addition to the careful and minute attention to details that were necessary until the work was completed.

The result in this case, it is needless to say, is gratifying both to the patient and to myself, and on her part was about equally divided between the wonderfully improved appearance of her nose, and her ability to breathe through it, which she had been unable to do for six years.

I expected to be able to present the patient for your inspection, but she was, I am sorry to say, called home last week.

This was a little earlier that I wished her to go, as I wanted to be sure of the complete and symmetrical healing of the tissues before she left.

From later reports, received since this paper was read, I learn that, by the patient's wearing the tubes until all tendency to contraction of the tissues about the nostrils had entirely disappeared, the result has proved entirely satisfactory.

IV.

TRYPSIN TREATMENT OF A CASE OF MALIGNANT DISEASE, INVOLVING THE LEFT TONSIL, BASE OF TONGUE AND EPIGLOTTIS.*

BY JAMES T. CAMPBELL, M. D.,

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Von Bergman states (1) that cancer of the stomach stops abruptly and sharply at the pylorus, that the small intestine is but rarely the site of cancer and that cancer of the large intestine and rectum for the most part increases in frequency the further the distance from the duodenum. In 10537 cases of cancer of the alimentary tract, the stomach was involved 4238 times, the small intestines 20, the large intestines 224, the rectum 1204 times. Considering the natural and comparative immunity of the duodenum and small intestines, and the slow rate of growth of cancer of the large intestine, it would appear that the theoretical treatment of inoperable cancer by preparations of the pancreas, bile salts, intestinal gland extracts and ferments (alone or combined), is readily supported. Pancreatic extracts, according to Vernon (2), contain two independent ferments, namely: pancreatic erepsin which does not exist in the form of a soluble zymogen and trypsin which does. Of the peptone-splitting effected by pancreatic ferments the larger part is due to pancreatic erepsin, a ferment quite different from trypsin and from intestinal erepsin.

In November, 1905, through the solicitation of Dr. J. Beard (3), lecturer in comparative embryology in the University of Edinburg, Dr. Wade began experiments to ascertain the action of trypsin upon the living cells of a carcinoma, such as Jensen's mouse tumor (an adenoma-carcinoma); to test the truth of the conclusion advanced by Beard (4) in 1902 that cancer was an irresponsible trophoblast; and to determine the length

*Read before the Chicago Laryngological and Otological Society, December 11, 1906.

of treatment and number of trypsin injections necessary to destroy the tumor. Eight mice were selected with well-developed Jensen's mouse tumor. Two were treated with trypsin and the others were used as controls. On the tenth day, during which time four injections had been made, one mouse died, but post-mortem revealed no cause of death. Upon microscopic examination all the cells of the tumor were in degeneration, fully half of them being represented by shapeless masses of particles which were probably the remains of nuclei, the rest were mere skeletons of cells. The somatic tissues of the mouse, as represented by the leucocytes and connective-tissue stroma cells were quite normal.

The other trypsin mouse was given nine injections in 22 days and then was killed to make comparison with a control mouse which had died of its tumor on that day. In the case of the control mouse the tumor was as large as the terminal phalanx of a man's thumb, but in that of the second trypsin mouse it was only the size of a lentil. Microscopically it was in advanced degeneration.

It is certain that the action of trypsin upon the cancer cell is to overcome the cancer albumin—a living substance—and thereby destroy the cancer ferment, malignin. In the cancer ferment, malignin, and in trypsin we have an antithesis of ferments, of which the latter is the more powerful.

Bashford (5) compares the identity of the sporadic malignant new growths of the mouse in all their anatomic features, with those of man, and the reproduction of the gross morbid anatomy of malignant disease as met with in the human subject, with the artificially propagated cancer of the mouse. It seems reasonable to believe that if trypsin injection destroys cancer cells in the mice, it may be employed with equal success to cure cancer in the human being.

Shaw-Mackenzie (6) says that repeated observations in cases of trypsin treatment have convinced him that shrinkage of the growth occurs simultaneously with relief of pain and unequivocal improvement in appetite, general nutrition and weight. In greatly advanced and hopeless cases it should be clearly understood that only relief from pain is to be expected.

Beard (7) advises giving *injectio trypsin* (Fairchild Bros. & Foster) in small amounts well diluted for a few preliminary injections. Then *injectio trypsin* daily up to two ampoules for three or four weeks. One ampoule on a certain day fol-

lowed by an ampoule of injectio amylopsini on the next day, and so on alternately for another period of four weeks. Lastly, one or perhaps two ampoules injectio amylopsini daily for about four weeks or longer, as the case may require. The injectio amylopsini follows the injectio trypsin in the latter period of the treatment and meets even from the start, any bad symptoms, such as nausea, vomiting, pain in the back, drowsiness, albuminuria, high arterial tension, edema, etc.

Should the trypsin injections still be not well borne, the quantity should be still further diluted and given more frequently, the daily amount being thereby undiminished. It is easy enough to kill every cell of a cancer with injections of trypsin, but for its removal and to prevent the formation of poisonous products from its degeneration, injections of the diastatic ferment of the pancreas gland amylopsini are absolutely necessary.

Dr. William J. Morton (8) reports 29 far advanced, practically hopeless and inoperable cases, about half of which were subjected to X-ray treatment, although to trypsin injection he attributes the marked benefits derived. Two cases of face cancer were cured and in all the cases signs of amelioration in the progress of the disease were observed, with improvement in the general health. Hemorrhages ceased and pains were alleviated. It was noted that during the amylopsin treatment the patients expressed their feeling of greatest improvement.

Case Report—J. H., aged 56, hotel clerk, of good family history, has had gonorrhea, but denies having had syphilis. On September 1, 1905, the patient weighed 168 pounds and about that time complained of pain over the left side of the face, which later became more manifest along the left lower jaw, in the ear, and from occiput to the vertex. As the pain was unrelieved, he had five left lower and two back upper teeth extracted. He was treated at various hospitals and clinics until May 9, 1906, when I first saw him at the Post Graduate Hospital. At that time, he could not protrude his tongue and swallowed with much difficulty the smallest amount of liquid, impulsively placing his hand as though to support the lower jaw. His speech was thick and indistinct, he had left facial paralysis and complained of constant pain radiating over the face from the angle of the left jaw.

Examination.—An indurated mass was found at the left side and base of the tongue the size of a filbert, an indurated

enlarged firmly fixed left tonsil, a much thickened epiglottis and ulceration in the glosso-epiglottic sulcus of the left side. The submaxillary gland of the corresponding side was large, hard and adherent. At my request he was examined by Dr. T. Melville Hardie, Dr. George Morgenthau and Dr. Frederick Besley, all of whom pronounced the disease malignant, and the case inoperable.

General Treatment.—We prescribed large and increasing doses of potassium iodid. Ten days later he had a violent hemorrhage from the mouth and was taken in an ambulance to the Cook County Hospital, where he remained more than five weeks. While there mercurial inunctions were administered daily for three weeks. He returned to us on July 2, and was under observation in the Post Graduate Hospital for three weeks. Large doses of potassium iodid were given, and the leucodescent lamp applied as a placebo; yet his condition gradually grew worse. His weight was reduced to 115 pounds and he was taking about four grains of morphin daily to allay the pain. As the patient was failing rapidly and nothing better could be suggested, we determined to try trypsin injections.

Trypsin Treatment.—August 25, 1906, five minims of Fairchild Bros. & Foster injectio trypsin, 3 per cent solution, diluted with ten minims of sterilized water, were injected under the skin over the enlarged gland, and on August 28 ten minims were injected in the same region. August 31 and on September 4 fifteen minims were injected, and we noticed that the swollen submaxillary gland, which had enlarged to the size of a hen's egg, during the course of one night just prior to the beginning of trypsin injection, was very rapidly decreasing in size. He was swallowing more comfortably and feeling so much better that he celebrated his improvement by indulging in a ten-day spree. September 16th, 20 minims (one ampoule) were injected and since that time one ampoule of injectio trypsin diluted with two volumes of distilled water has been injected under the skin of the buttocks each alternate day. September 18th, he weighed 123 pounds, and September 20th, 126 pounds (a gain of three pounds in two days), and he has taken but one-half grain of morphin in these two days. He drinks two quarts of milk daily in addition to a diet of eggs, oysters, beef, mutton, cereals, etc. At the present time his weight is 133½ pounds. He has little or no pain and is taking

no opiate. His color is good, tongue fairly clean, the infiltrations in the tongue, tonsil, epiglottis and submaxillary region have greatly decreased. He says that he feels well and believes himself cured. For a week past, injectio amylopsini has been given each alternate day.

Unfortunately, our early diagnosis was clinical only. Recently I removed sections from the tonsil and the laboratory diagnosis by Professor Zeit was pronounced "infective granulomata." As infective granulomata include tubercle, lupus, syphilis, glanders and farcy, leprosy and actinomycosis, without going into details I think we may exclude all except syphilis and tubercle. He denies ever having had a chancre, he never had secondary manifestations of syphilis, the infiltrations never broke down, they maintained their stony hardness under persistent antisyphilitic treatment. Against tubercle, no tubercle bacilli nor giant cells were found in the microscopic section; he has not the characteristic pallor of mucous membrane found in tuberculosis. There is no pulmonary involvement. My belief is that the growths are carcinomatous, that what improvement has been brought about is entirely due to trypsin, and that the granular cells found by Professor Zeit are degenerated cancer cells.

In conclusion, I wish to express my indebtedness to Dr. Hugh A. Cuthbertson to whose painstaking efforts this patient's improvement is due.

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V.

THE CONSERVATION OF HEARING IN OPERATIONS ON THE MASTOID REGION.*

BY W. SOHIER BRYANT, A. M., M. D.,

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The amount of residual hearing following the various kinds of mastoid operations depends, (1) on the integrity of the sound perceiving mechanism; (2) on the amount of the sound conducting mechanism left by the disease; (3) upon the functional efficacy of this conducting mechanism; (4) upon the amount of the conducting mechanism remaining after the operation; and (5) upon the functional efficacy of the sound conducting mechanism remaining after the operation.

The first three conditions require no discussion. The fourth condition is fundamentally a question of the amount of destruction which the disease has caused, while secondarily and practically it is a question of how much of the mechanism the surgeon will be able to save? It is far easier for him to attack the tympanic contents indiscriminately, or make a clean sweep of everything in the tympanum, taking the healthy with the diseased structures, and to use the probe unrestrained by consideration of its effect upon the acoustic balance, than to save the parts of the conducting mechanism which the disease has not seriously injured and avoid touching or dislocating them.

When the simple mastoid operation is sufficient to fulfill the surgical requirement, the operator can conserve the ossicular chain intact if he is content to stay his hand at the aditus ad antrum, nor let his curiosity carry his probe as far as the incus. The surgeon who is about to perform a tympano-mastoid operation can serve the interests of the patient and preserve an important fraction of hearing if he will spend a few minutes previous to operation and examine the tympanum through the meatus in order to locate the structures which are not sufficiently diseased to require removal, such as the stapes

*Read at the meeting of the Eastern Section of the American Laryngological, Rhinological and Otolological Society, January 5, 1907.

and neighboring portions of the drum membrane, and in some cases the whole ossicular chain. In the cases where something more than a simple mastoid operation is required, the middle ear may need to be encroached upon more or less and some unavoidable injury must necessarily befall the sound conducting mechanism. There is a great difference in the effect on the residual hearing if the major ossicles and stapes are removed or dislocated in whole or in part, or if they are preserved in position.

The fifth condition on which the maximum of residual hearing depends, namely, the functional efficacy of the remaining portion of the sound conducting mechanism, is capable of much amelioration if the ossicles are preserved in position without dislocation and if careful consideration is given to the action, deficiencies and needs of the conducting mechanism in the individual case. Just as in cutting off a leg there is a point of election, so too in the middle ear. In the middle ear certain portions of the structure should be saved together, and certain others removed together. It is important for the middle ear, as well as for a leg, to have a stump that can readily be fitted with a mechanical appliance. An artificial drum membrane is of great post-operative service when a suitable stump has been left.

There are five rules to guide us in disposal of the tympanic structures: (1) The tympanum should be restored to its normal condition with nothing taken away if the malleus is left. (2) The incus should be removed if the malleus is out, because the incus acts as a damper of the stapes. (3) The posterior attachments of the membrane should be preserved after loss of the malleus and incus, because this part of the membrane can be trained on to the stapes and act as a sound transmitter for it. (4) The tympanum should be kept open when the malleus and incus are gone, in order that the sonorous oscillation may infringe on the fenestrae and promontory with the least loss of intensity. The anterior attachments of the membrana tympani should then be preserved and this part of the membrane trained across the ostium tympanicum tubae to close it and prevent infection reaching the middle ear from the pharynx. (5) The tympanum should be kept open and the major ossicles removed if the stapes is out, to allow the freest access of sound waves to the labyrinth.

Careful examination of a large number of cases has shown

us that the common hindrances to maximum transmission of sound are due either to unnecessary dislocation caused in the operation, to fixation of oscillating parts by cicatricial tissue, or to the dampening of the fenestrae. All these obstacles are usually combined. Cicatrices are the most easily demonstrated cause of reduced residual hearing. When the cicatrices are least in thickness or density, or, what is the same thing, when the tympanum approaches closest to normal in regard to the covering of the ossicles, ligamentous parts and fenestrae, the best hearing is obtained. The acuteness of hearing is also in proportion to the integrity of the ossicular chain. The more that is kept of this, the better the result. The preservation of all the finger tissue possible in the treatment of injured hands is of great importance to the later usefulness of the member. The same might be said of the ossicular chain,—that all the ossicular tissue possible should be preserved, even a small stump of the malleus is valuable.

We found that the cases with the best hearing were those which had the shortest tympanic convalescence, other things being equal, while those with the poorest residual hearing were the cases which had gone through a lingering tympanic convalescence.

The rapid restoration of the tympanum together with its function can sometimes be facilitated by allowing the membrane to heal up quickly, while drainage is kept up in some other direction as long as it is required. The necessary drainage may be obtained through the Eustachian tube, the mastoid wound, or best of all, because there is no disfigurement, through an opening in the posterior membranous wall of the canal just external to the annulus. This method or drainage requires extensive removal of the posterior osseous wall. After the complete radical operation the tympanic drainage through the meatus is perfect.

The use of skin grafts in the tympano-mastoid operations does not seem to lessen the amount of dense tissues covering the stapes.

The following cases are mentioned with the intention of showing the methods employed to secure the best conditions for the preservation of hearing.

First Case.—A simple mastoid operation with epidural complications on a girl 16 years old. Middle ear was not attacked at the operation except by a very extensive myringotomy. Mid-

dle ear dry on the fourth day after operation, watch heard 20 inches. On the tenth day the membrana tympani was completely healed and the watch was heard 4 feet; six months later the watch was heard 8½ feet.

Second Case.—A modified tympano-mastoid operation was performed for recurrent mastoiditis and otorrhea on a lad of 17. The tympanum was invaded from behind, above, and through the membrane as far as it was possible to go without dislocation of the ossicles. On the fifth day after the operation the middle ear was dry; on the tenth day the membrana tympani was completely healed; on the fifteenth day, watch was heard 13 inches; ten months after the operation watch was heard 6½ feet.*

Third Case.—Tympano-mastoid operation for chronic middle ear suppuration and tympanic caries. Woman, age 24. None of the ossicles present at time of operation. No skin graft used. On the twenty-second day after the operation the tympanum was dry and epidermitized. Two years and three months after operation, watch heard 10 inches.

Fourth Case.—A very slow mastoid convalescence with comparatively good hearing. Man, age 77. O. M. P. C., left, perforation of membrane, mastoiditis, osteomyelitis and scattered pus foci; operation uncovered aura of middle fossa and knee of sinus. Posterior wall of canal extensively removed, membranous canal perforated posteriorly. Mastoid wound sutured around small drain, no packing. Fourth day wound closed by first intention. Abundant serous discharge from the meatal opening. The wound within filled up very slowly, discharging serum through the fistula in canal. Did not suppurate. Thirty-ninth day, fistula in canal finally closed. Acumeter O. S. 7 inches, O. D. 4 inches. Eighty-first day, watch heard 10 inches from the left ear.

Conclusion.—The maximum post-operative hearing is obtained by judicious preservation of the sound conducting mechanism, and by the most rapid possible convalescence of the middle ear.

*The writer performed his first operation of this kind at the New York Eye and Ear Infirmary, July 29, 1905, and therefore claims precedence in this procedure.

VI.

ROUTINE NASOPHARYNGEAL EXAMINATION IN THE PREPARATORY SCHOOL.

BY JAMES A. BABBITT, M. D.,

PHILADELPHIA.

Almost startling strides have been made in the past few years in routine precautionary oversight of school children. Each successive administration inaugurates some new system of medical and hygienic supervision. Boards of civic and educational control, corporations, municipal and private institutions, manufactories and large business houses—nearly all have definite methods for periodically reviewing physical conditions of the men, women and children under their supervision.

In every case the principal involved lies in the time-worn adage "prevention is better than cure," prevention not only concerned in the welfare of the individual, but also in the welfare of those surrounding them.

The purpose and indication for routine care in the preparatory schools rest upon the fact that as well in special senses as in general conditions, numerous fundamental conditions of defect exist, and at this stage of life their effect upon general body metabolism and co-ordination may be functional rather than organic.

It will be generally admitted that defects, obstructive and otherwise, in the nasopharyngeal region affect the general system, and that at the preparatory school period, each such discovered, with subsequent recommendation for relief, is of paramount importance to the school boy's condition.

With our modern acceptance of infectious theories, it is of no less importance to protect the boy's companions in study than himself.

Chronic follicular infections of the tonsil, the discharge of a suppurative otitis media (for the ear belongs to the throat group), mucopurulent sinus discharge—all these present a positive danger in the close contact of school boy life.

On the other hand certain difficulties in examination present themselves and their consideration is but fair. First of all comes the conflict with school time schedule. If the tests and examination include chart reading for sight and tuning-forks for ear in complete review and also require condensed-light reflection, the boy must be excused directly from all class room work to report at proper office, or the work done by special outside appointment, which is at the best unsatisfactory. This conflict, however, with curriculum, after all but slight, holds little weight with the cautious master who sees the importance in special sense protection.

The next obstacle may be both subjective and objective, the former dependent upon the boy's unwillingness to appear for any such examination and objective on the part of his parents or local physician. Such objection rests upon careless estimation of the importance attached to this department coupled with a selfish resistance to disturbance of individual prerogative, and on the part of certain family physicians to consider such regulation a slight upon their family supervision.

Finally by way of caution must be considered the danger of magnifying conditions of minor importance, and stimulating by suggestion processes primarily but simple.

In spite of the above limitations we unanimously decide upon the examination and now what simple method can be suggested for making a reasonably thorough examination of ear, nose and throat and consistent with school surroundings?

After selecting the time period most suited to the class under review, it is well to have boys report in primary group of three, each boy as he returns sending another out. This enables the exchange to be accomplished without appreciable loss of time for the examiner, and by allowing each boy to observe at least one previous test, relieves the necessity of reassuring the smaller and timid lads, and the delay from taking awkward positions.

In the examining room should be arranged condensed light, bowl of antiseptic solution in which to cleanse instruments between tests, two or three ear speculums with obtunded edges, tuning fork of two hundred vibrations, and it may be well to have Galton's whistle and otoscope accessibly near for special cases. Good, comfortable nasal metallic or hard rubber speculums should also be provided, and wooden tongue depressors. In addition throat mirrors, sizes one and four, for nasopharyn-

geal and laryngeal examination when indicated. While one boy is under inspection, the recording assistant should obtain all data possible as to previous history, localized headaches, catarrhal troubles, former earaches and discharge from any focus. History of former operations in this region should also be ascertained from the subject examined.

In routine examination we suggest the following system: First, by inspection and palpation, note conditions of glands, deflection of external contour of nose, or any bulging in mastoid region, evidence of operation, appearance of any discharge, condition and formation of teeth, and any habitual cephalic posture.

This examination might well be made during conversation which would both suggest any vocal disturbance and by distracting the boy's attention, prevent unnatural position.

In order to relieve any timidity, we would suggest beginning the examination with the ears, first noting condition of the auricle externally, then inspecting canal for obstruction and discharge, and finally with aural speculum whose size has been indicated during these preliminary steps, studying appearance and condition of tympanic membrane. While such tests with boys are unsatisfactory, it would be well to make simple tuning fork trials on either side, and if by this time examination or history has elucidated further evidence, more minute examination may follow.

The examination of the nares, next in order, reveals condition of the septum, turbinates and nasal floor, with character of discharge if any be present, and in all probability proves the presence of adenoid enlargement. This brings us to the most disagreeable part of the test in the lad's estimate, that of the mouth and pharyngeal chamber.

By using a comfortable tongue depressor with slight but firm pressure and careful adjustment, the entire wall can be fairly well viewed, and a surprisingly large number of cases will admit a good view of the pharyngeal vault and larynx by mirror if needed. In this examination size and condition of the faucial and lingual tonsils and evidence as to any enlargement likely to affect the Eustachian tubes should be carefully noted.

In cases of follicular tonsillitis or ulcerated mucous membrane, we have sufficient evidence in investigating further systemic conditions.

Laborious and painstaking though this examination may appear it really occupies but a few moments, provided proper arrangement of chairs and adjustment of light be effected.

By adopting such system of routine care what results have been obtained? First among defects we find a preponderance of "mouth breathers," but it would be ridiculous before this body to enumerate the cases of enlarged pharyngeal tonsil overlooked by the family physicians. Frequent as this condition is and serious in its effects upon the general system, other conditions of no less importance are sufficiently numerous. Old suppurative conditions of the ear perhaps with but very slight discharge and with only initial effect upon mastoid cells, may be found and placed under proper direction and care. Old infected foci in the tonsils, of themselves not seriously important may be sufficiently advanced to influence metabolism. Bony malformations in the nose, old sinusitis discharge, catarrhal changes in the larynx, each in turn may be remediable under prompt treatment.

In brief, the advantages to be derived from this careful supervision are to the individual, the school and the community. To the individual in the discovery of hitherto unnoticed pathologic conditions—to the school in cultivating a spirit of special interest in the student's physical welfare, in revealing conditions more or less generally infective in their character, and in rationally explaining oftentimes obscure conditions of vasomotor inactivity and torpid mental reaction (sometimes profound impediments are found which may not only affect his subsequent educational care, but possibly remodel his future life)—to the community, first in the elimination of direct infection, and secondly in permitting the eradication of those subconscious effects produced by the constant proximity of physical weakness and deformity. Such simple conditions as the hoarse tone and nasal voice have an undefined though definite influence on surrounding students.

In making these examinations it will be well to emphasize again the necessity for cautious advance in this direction. We must consider the individual type before us, must discover as much as possible without the subject's notice, must carefully eliminate the possibility of autosuggestion and guard the effect of our examination upon the family and family physician.

We desire co-operation, not antagonism; we desire to cultivate a judicious oversight but not a weakening of the now

almost national sense of admiration for physical hardihood; we desire to produce health and not favor or suggest invalidism; therefore, it will be well to repeat the caution in our preface, and consider the individual type before us from his own standpoint and in relation to his home and family physician's care. One clear case discovered in each fifty referred with cautionary advice of definite character, amply repays the monotony of the system, and this wisely directed special examination in the preparatory school should result in a co-operative spirit from master to instructor of lowest form in rounding out the healthy, physically perfect American boy.

VII.

A METHOD OF FORMING A SKIN AND PERIOSTEAL FLAP IN TYMPANO-MASTOID EXENTERATION.

By E. M. HOLMES, M. D.,

BOSTON.

The purpose of all operations upon the middle ear and mastoid area has been to obtain drainage for pathologic secretions, to remove diseased and abnormal tissue, and to open it for inspection and more positive diagnosis when some symptom or symptoms were present which might be due to a grave pathologic condition in the cranial cavity, the lateral sinus or the jugular vein.

From the time when only those cases, in which nature had gone so far as to burrow through the mastoid cells and cortex and produced a retro-auricular infection or abscess, were relieved by a Wilde's incision or similar procedure, the progress has always been in the line of a more extensive and thorough operation; and today nearly all aural surgeons are agreed that to obtain successful results all necrotic and diseased tissue must, so far as possible, be removed, all pockets and recesses which may harbor secretions must be avoided; and that the best method in any case is that which will thoroughly remove disease, give perfect drainage and favor a rapid convalescence with a final epidermization of all exposed surfaces.

To accomplish this many kinds of skin and periosteal flaps have been devised. The grafting of skin from other localities has also been extensively practiced. It is not my purpose in this paper to describe or to criticize all or any particular method of forming flaps in making skin grafts, nor is it seemingly possible to adopt any method which can be successfully used in all cases. What I wish is to describe a method which I adopted five years ago and one which, so far as I can learn, has not as yet been described.

The usual methods of procuring flaps are in some manner to form a tongue of skin from the mastoid area and carry it into

the mastoid wound or to form a flap from the inner portion of the auditory canal nourishing the same by retaining an attachment to the outer portion of canal. I use the inner superior posterior portion of the skin and periosteum of the canal and preserve its attachment to the periosteum covering the mastoid bone.

In performing this operation the post-auricular incision differs from that usually made in that the skin only is incised and that somewhat nearer the auricle, care being taken not to injure the periosteum. The anterior skin flap is dissected and carried

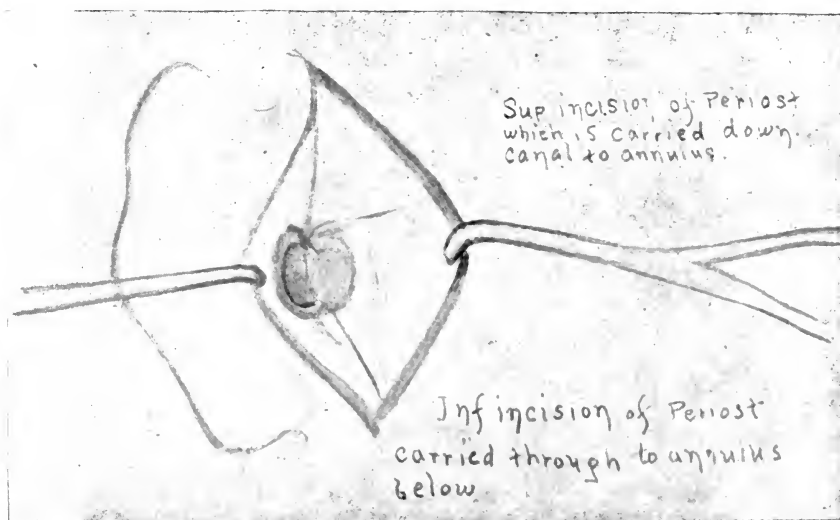


Fig. 1.

forward until the posterior and superior portion of the cartilage of the external auditory canal is exposed. An incision is now carried through the posterior and superior wall of the auditory canal and the auricle thus partially detached is carried forward. The anterior and inferior portions of the canal are not injured. With a semi-blunt knife and periosteal elevator which I have made, an incision is carried through the skin and periosteum of the bony canal from the incision already made beginning at the junction of the lower and middle third of the posterior wall extending to near the annulus, then by an upward course paral-

lel with annulus to junction of superior and anterior wall, then outward to rim of bony canal. From this the periosteum is incised over the linea temporalis as far back as to give ample exposure of bone. An incision is also carried through the periosteum from beginning of auricular incision below, backward and downward to posterior portion of mastoid tip.

Considerable care should now be exercised in removing the auricular skin flap so as not to injure that or its attachment to the post-mastoid periosteal flap. After this has been completed the mastoid portion is easily elevated with the usual instruments and the whole carried back and wrapped with gauze moistened with sterile normal salt solution. We have now a clear field for performing a radical mastoid operation, and after all diseased areas and pneumatic cells whether or not diseased have been removed, the bone is carefully smoothed so that there shall be as few uneven areas as possible, for it is important that the periosteal flap when replaced shall be in as perfect adjustment to the bone as possible. We have now to cleanse the wound and we cannot be too thorough. I have found that a sterile normal salt solution has given as good if not better results than any other. When we are sure that we have as far as possible removed everything which might act as a focus for infection the gauze can be removed from the flap of skin and periosteum which is now carried forward and adjusted.

Unless there has been very extensive disease this flap covers nearly all of the exposed bone, the attached portion of skin taken from auditory canal will now cover the area which was the aditus and attic of middle ear.

The next step is to adjust the auricle, and in order to prevent the tendency to produce a subsequent occlusion and to get sufficient room for subsequent treatment it seems well to split the posterior portion of the cartilaginous canal and then with gut suture the upper segment to periosteum over linea temporalis and the lower mastoid segment to that of the tip of the mastoid. The skin can now be closed and sutured and a small gauze pad so adjusted as to exert gentle pressure upon the mastoid thus keeping the periosteum in contact with the bone below and the skin above.

The auditory canal is now inspected and the skin flap adjusted if necessary, after which a gauze or gauze wrapped rubber tube is inserted to secure drainage from the middle ear.

The operation I have here described cannot always be carried out. A marked periosteal inflammation, a destruction of much of the periosteum, an extensive adhesion following simple mastoid operation, or spontaneous rupture may make it impossible to obtain a healthy skin flap. After making the first incision we can usually decide the question by inspection of the periosteum.

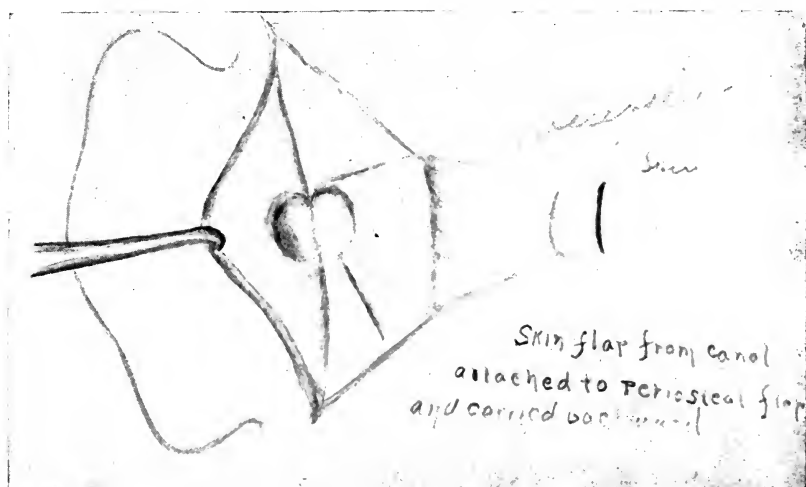


Fig. 2.

Again, it is not always good surgery to close the post-auricular wound, but the skin flap can be preserved even when the post-auricular wound is drained.

I have employed this method in 27 cases and have obtained excellent results in the majority, but as there is not space for a report of individual cases at this time I will shortly present another paper containing a record of all cases in which this operation has been performed.

VII.

OUR FAULTY METHODS OF BRAIN LOCALIZATION IN INTRACRANIAL LESIONS COMPLICATING AURAL DISEASES.*

BY S. MACCUEEN SMITH, M. D.,

PHILADELPHIA.

It is not my intention to treat the subject of intracranial complications in an exhaustive manner, but merely to bring it to your notice, with the hope that the discussion which follows will establish some points in differential diagnosis of brain lesions complicating aural disease.

In determining the presence and location of a brain tumor, where the patient's life is in no immediate danger, distinct localizing symptoms can be waited for, and a definite diagnosis can be deferred; but in a case of intracranial suppuration, in which a life may be saved by immediate action, or sacrificed by delay, we have an altogether different problem confronting us.

This extremely difficult question resolves itself into two parts:

First: Whether or not a cerebral abscess is present.

Second: What is its location?

A critical analysis of the manifold symptoms will usually enable us definitely to determine the former, but an accurate, unqualified answer to the latter is still extremely difficult, and in most instances, impossible of precise interpretation. Each succeeding generation has produced its investigators, profoundly learned and skilled in the dissecting room and at the autopsy, and yet, as Prof. Keen has pointed out, "fifteen years of experimentation (vivisection) have taught us more than the previous fifteen hundred years of careful observation and post-mortem examinations."

We must respectfully defer to those best qualified to deter-

*Read before the Eastern Section of the American Laryngological, Rhinological and Otological Soc., at Providence, Jan. 5, 1907.

mine the value of continued vivisection, in its relation to additional knowledge in exact brain localization. Judging, however, from the remarkable progress made in the recent past by those pursuing these scientific and humane investigations, it does not seem unreasonable to predict that the profession, in the near future, will be in possession of knowledge, the proper utilization of which will be the means of saving hundreds of valuable human lives, that today are being sacrificed unnecessarily, the anti-vivisectionists to the contrary notwithstanding. Only with such knowledge at our command will we be able to emulate the brilliant achievements accorded localization through the motor area.

We feel that we know something of the area presiding over sight, but much less of general sensation, hearing, smell and taste, while that controlling the intellect is still almost wholly in the dark. The establishment of invaluable, comprehensive facts regarding the motor area was made possible only by scientific experimentation, mostly on the lower animals. As conclusive proof that the results thus obtained have more than justified the methods employed, I have only to remind you of the brilliant achievements of the latter-day surgeon and his co-workers in motor localization and all that appertains thereto.

In uncomplicated cases our methods of localization are fairly accurate and can be relied upon in the majority of instances. Unfortunately, however, most of the patients coming under our observation present symptoms so complex, and therefore so unreliable and confusing, that we are often greatly perplexed in our efforts to locate the intracranial lesion accurately, and finally are compelled to arrive at a diagnosis by the process of exclusion, which frequently means little more than guesswork. This procedure, to say the least, is unscientific, and in some respects, reprehensible and unbecoming a learned profession.

It may justly be claimed that by personal intuition or some other occult power of reasoning, our success in locating and evacuating intracranial abscess formations so largely predominates that criticism of our failures, in view of recent advances made in this direction, is unfair. At the same time, in a patient presenting the symptom-complex, and these are the cases usually met with, we may select a point for operation without tangible, or at least convincing, proof of a correct diagnosis. The exigency of circumstances naturally impels such action,

and largely justifies this "hit-or-miss" practice, inasmuch as prompt evacuation of the pus offers the only possible means of relief. Other things being equal, the writer would select the temporo-sphenoidal region for operation, from the fact that he believes this locality most frequently involved, whereas another surgeon, for similar reasons, would select the cerebellum. It is possible, but unlikely, that both regions may be implicated. Should we fail to find pus in the locality primarily selected, it then becomes our duty to explore another, thus subjecting the patient to the shock and danger incident to two or more operations on the delicate structure of the brain. It is indeed true that under modern surgical practice and aseptic precautions, the brain will tolerate almost unlimited exploratory measures. Nevertheless we must remember that each minute particle probably has its own special function, and physiologically is so arranged that the functional harmony is unbalanced in direct proportion to the molecular disturbance, as well as by the locality involved. This is especially noticeable in the impaired mentality and other abnormal manifestations observed in some patients following operations on the brain.

We all recognize that pressure symptoms are made evident by headache, nausea and vomiting, vertigo toward the diseased side, mental and physical depression, marked lethargy, convulsions that may be attended with loss of consciousness, probably choked disc or optic neuritis, as well as reduced pulse rate and temperature. In a given case showing the above symptoms, especially when sudden in development and following a period of impaired health, we may be assured of the existence of an intracranial lesion. The point of vital importance is our ability to locate accurately the pus formation, since its prompt evacuation is the only means at our disposal offering relief. It is not sufficient to satisfy ourselves that a given region of the brain is involved, such as the cerebrum or cerebellum, but we should be able to designate definitely and finally the exact location of the lesion, as well as determine the amount of destruction incident thereto.

Bruhl points out that in a lesion of the third frontal convolution, on the left side, we find agraphia and alexia; in lesions of the first temporal convolution on the left, word deafness, crossed deafness, and anosmia; of the occipital lobe, optic aphasia and hemiopia. When the lesion is situated around the fissure of Rolando, epileptiform convulsions and crossed paralysis of

the extremities and facial paralysis are present. In lesions of the cerebellum, ataxia, vertigo, staggering gait, nystagmus, emaciation and rigidity of the muscles of the neck are manifested. These latter symptoms, taken in connection with the severe occipital pain increased by percussion, the marked vomiting, frequent yawning and extreme prostration, together with the flexed limbs and upturned face, would seem to be characteristic of cerebellar abscess.

However, I have seen cases operated upon for cerebellar abscess in which no pus was found, notwithstanding the fact that many of the above enumerated symptoms were present. In one case in particular, the post-mortem examination revealed the presence of non-infectious sinus thrombosis, the inflammatory condition extending to the meninges and brain tissue adjacent thereto. In this instance the symptoms showed that the lesion was located in the region of the cerebellum, but the interior of the cerebellar lobe was absolutely normal.

Briefly stated, the symptoms of brain abscess in general are as follows: Pain in the head is the earliest symptom, and at first is very severe, but later it becomes a steady, dull ache, and is present as long as the patient retains consciousness. It is increased if the cranium is percussed or pressure applied. At the beginning the patient has a high temperature, which soon drops to normal or subnormal, but in case of rupture, the absorption of toxin and the removal of pressure cause another sharp rise. When the temperature is highest, the pulse is usually rapid, but later it slows down and remains so until pressure is relieved by rupture of the abscess, when it again becomes rapid. Respirations are slow, deep and stertorous. There will be cerebral or reflex vomiting, i. e., emesis with a clean tongue, and not dependent on the ingestion of food. In the beginning, the only ocular symptom present will be photophobia, but later the pupil on the affected side becomes dilated and examination of the eyeground shows optic neuritis. Usually in advanced cases of brain abscess the patient is in a state of stupor, being hard to arouse, and only performs acts or answers questions after he has been spoken to several times, if indeed he can be aroused at all.

If the abscess is in the region of the Rolando fissure, certain muscular centers may be pressed upon, and thereby it manifests its presence in the form of Jacksonian epilepsy. But cerebral abscesses of otitic origin are seldom found in this region.

Their location is usually either in the temporo-sphenoidal lobe or in the cerebellum.

A great majority of these abscesses are found under what Barker calls the "dangerous area." This is within a circle having a radius of $1\frac{1}{4}$ inches, which has for its center a point $1\frac{1}{4}$ inches above and behind the external auditory meatus. They are often found not directly in contact with their source of infection, but with about an inch of healthy brain tissue intervening, this, of course, occurring when the infection is carried by the venous system.

It is sometimes noted that the local temperature is higher immediately over the seat of the abscess, even though the body temperature is subnormal. Macewen has found in some cases that in percussion of the head a higher note is elicited over the abscess than over the rest of the head.

A point of the greatest value, and one, furthermore, that explains the fatal termination of many cases that succumb after the pus has been evacuated, is the development of satellitic abscess formations, arising from the parent abscess cavity. These foci are usually separated from each other by a thin wall of healthy brain tissue. Here again, accurate localization would enable us to determine definitely the situation of additional metastatic pus areas.

W. Milligan¹ states that "the occurrence of sensory aphasia is a symptom in cases in which a pathologic lesion is situated in the temporo-sphenoidal convolution; of motor aphasia, when the lesion is in the third left frontal convolution, or when pressure, say from an adjoining temporo-sphenoidal abscess, is exerted upon this center; of twitching paresis or paralysis of various methods or groups of muscles, when the cortical center which controls these muscles is interfered with, either as the result of an irritative and spreading meningitis or as the result of the pressure of a gradually increasing focus of supuration." Hemiplegia signifies that the contents of the abscess press upon the internal capsule. Involvement of the third nerve is a symptom of temporo-sphenoidal abscess; sometimes the sixth nerve is involved in the same lesion. In cerebellar abscess we sometimes find optic neuritis followed by atrophy. An uncomplicated otitic cerebral lesion is not difficult to diagnose, but when one or more lesions occur together then symptoms of one overlap or mask those of the other.

Gradenigo² draws attention to the fact that encephalic abscess consecutive to purulent middle-ear otitides are situated either in the temporo-sphenoidal convolutions or in the lateral lobe of the cerebellum, and in both instances are near the diseased temporal bone. Up to the present time the same description of symptoms has been applied to the two kinds of abscesses. Nevertheless, the pathogenic, anatomic, and therapeutic differences that exist between the two forms of encephalic abscess justify a special description of each. Gradenigo then proceeds to describe the symptom of otitic cerebellar abscess: "Cerebellar abscess is less directly in relation with osseous lesions than cerebral lesions. Infection is conveyed to the cerebellum either by the sigmoid fossa or by the labyrinth through the internal auditory canal. With cerebral abscess there often co-exists sinus thrombosis or leptomeningitis. Differential diagnosis of these lesions is most difficult. Neither optic neuritis, lateral nystagmus, vertigo nor rigidity of the nucha is a special symptom of cerebellar abscess."

When blood counts were first made to determine the presence or absence of severe infection, leucocytosis was the all-governing factor, but more careful study, with numerous observations, has shown that a differential count must be made and that leucocytosis is more an index of body resistance to infection than of its severity.

For example, a person with good resistance may have marked leucocytosis as the result of a slight infection, and on the other hand, a person with impaired resistance may have little or no increase in the number of white cells with a very severe infection.

The relative number of polynuclear leucocytes is of the greatest significance in the determination of the presence of a purulent or gangrenous process. The normal percentage of these cells varies between 59 per cent and 68 per cent, with an average of about 61 per cent. If there is a relative count of less than 70 per cent, no pus need be suspected. Pus is not common with less than 80 per cent, except in children, where it has been found with a count as low as 73 per cent. About 93 per cent indicates a very severe process, and when it reaches 95 per cent, it may be considered almost fatal.

Fowler³ cites two very interesting cases.

Case 1.—A young woman with serous otitis media had pain, rapid pulse, temperature, etc., indicative of acute mastoid dis-

ease, but as the polynuclear cells reached only 59 per cent, operative procedure was deferred and the patient recovered without operation.

Case 2.—A young man recovering from mastoid involvement as a result of an acute purulent otitis media, for which he had been operated upon, began to show evidence of meningeal irritation, with only slight inflammation, except that the polynuclear cells were up to 83 per cent. Operation disclosed a large abscess, and the patient subsequently died from meningitis. In both of these cases the percentage of polynuclear cells was accepted as an index for or against surgical interference.

From these observations we reach the following conclusions:

First.—A marked leucocytosis with a relative percentage of polynuclear cells below 70, shows slight infection with good resistance.

Second.—A marked leucocytosis with relative percentage of polynuclear cells above 80, shows severe infection with good body resistance.

Third.—Slight or absent leucocytosis, with relative percentage of polynuclear cells above 80, shows severe infection with impaired resistance.

An interesting contribution on this subject by McKernon⁴ in which he reviews his findings in one hundred and sixty-six cases, confirms the value of the differential blood counts in septic cases.

I am indebted to Dr. J. Chalmers Da Costa for the following notes:

"That an abscess may cause focal symptoms is undoubtedly true, but in some regions it never does; and in some instances, when situated in a region in which one would expect it to be, it does not do so. The diagnosis may rest to a very large degree upon a history of the injury; the existence of some suppurating condition, particularly about the head or face; or the presence of some bacterial disease. When a person suffering with one of these conditions develops headache, slowed pulse, vomiting, irregular or subnormal temperature, and stupor, there is infection within the cranial cavity, which may be due to meningitis and may be due to abscess. If, in such a condition, there is evidence of localization of a process, the diagnosis of abscess is certain. Hence, focal symptoms should always be sought for, and are of the greatest possible value when found."

Abscess in or near the motor cortex may produce spasms, as a brain tumor does; but Mills points out that spasms are less frequent in abscess than in brain tumor, and even if present, do not have "such definite initial or signal symptoms." Of course the focal symptoms, if they exist, vary with the situation of the abscess, its size, the regions into which it passes, and its association with purulent meningitis.

In ear disease, the abscess is usually found in the temporo-sphenoidal lobe; and in that case it is occasionally found that there is loss of power on the opposite side of the body. This symptom may confuse us, and lead us to believe that an abscess is not in the temporo-sphenoidal lobe. When this condition is met with, it results from "pressure upon the fronto-parietal region, across the Sylvian fossa." (Mills.) An abscess in the temporal region of the left side may cause word-deafness or perhaps amnesic aphasia. So, too, the third nerve on the side of the abscess may occasionally exhibit the effects of pressure.

It is difficult, or impossible, to locate from symptoms the existence of an abscess in the frontal lobe. Abscess of the cerebellum may present definite cerebellar symptoms, and may induce focal symptoms; and it can readily be confused with tumor. If we are in doubt, and suppurative ear disease exists, the chance is in favor of abscess rather than of tumor; but if there has been an injury of the head, the chance is probably more in favor of tumor than of abscess. The symptoms of tumor are more gradual in onset, and there is the absence of the temperature to indicate some suppurative process, which in cerebellar abscess is apt to be elevated in the beginning of the case and subsequently become normal or subnormal. Again, in tumor choked disc is much more frequent than it is in abscess.

I think it is a correct statement to say that whereas the localization even of tumors is made with great difficulty, the localization of abscesses is often more difficult still.

Francis T. Stewart⁵ trephined two cases in which a diagnosis of abscess of the brain had been made, but failed to find pus. Both of these patients died, and one proved to be a case of uremia on post-mortem; autopsy was not obtained in the second case. He also saw several cases in which the surgeon failed to find pus, although diagnosed as abscesses. He also reported several cases in which pus was evacuated after the

skull had been opened for other conditions and in which pus was not suspected. He also mentions another case in which an extradural abscess was evacuated and the patient died from a cerebral abscess. Another case which came under his observation was one of the thrombosis of the lateral sinus which he drained, and in which an eminent neurologist subsequently made a diagnosis of abscess of the brain, owing to the persistence of symptoms, but in which the autopsy revealed no suppurative lesion other than that of the sinus.

Gardnes⁶ reports a case of abscess of the temporo-sphenoidal associated with aphasia, alexia, agraphia and ptosis, which he explains by the fact that from the temporal lobe a band of associated fibres, which have to do with speech, proceeds to the frontal lobe, and a second band, a lesion of which causes alexia, extends to the occipital lobe.

Although an abscess of the temporo-sphenoidal lobe may be present and usually does exist for a period without producing definite symptoms, the following case, nevertheless, shows conclusively that pus confined within the temporo-sphenoidal lobe may suddenly produce symptoms simulating those of sinus thrombosis.

The patient, a man of fifty-two years of age, suffered for the past forty-two years from the recurrent type of chronic otorrhea, a sequel of measles; the intervals between the periods of aural discharge ranged from six weeks to four years. He was repeatedly advised not to have his ears treated, "as it might go to the brain," so he simply syringed the ear with weak soap suds whenever there was any discharge present. It is worthy of note that during the past two years, his acute exacerbations were progressively more frequent and accompanied by severe pain over the mastoid and adjacent region.

The writer saw him during his last attack, it being unlike any of the former ones, and characterized by an abrupt cessation of the discharge, the temperature suddenly rising to 105.2, with severe pain in and around the ear, being especially severe over the mastoid. He had severe chills, followed by marked remission in the temperature and severe sweating. Optic aphasia was well marked. These symptoms being characteristic of sinus thrombosis, an immediate operation was advised. Careful examination did not show the slightest evidence of jugular involvement. During the Stacke operation a moderate amount of necrotic bone was removed; the greater part of the

process, as is usual in chronic cases, was exceedingly dense and difficult to remove. The bone covering the sinus was hard and apparently healthy, except in some few spots, where eburnation was not yet complete. Much to my surprise, the sinus, when exposed, proved to be entirely normal. The only point at which free pus was found was in the tympanic cavity and the mastoid antrum, and even there in very small quantity.

Further examination revealed a small carious opening through the tympanic roof, which, upon being enlarged, revealed a quantity of foul-smelling pus oozing through an inadequate opening in the dura. Both openings were then enlarged to provide proper drainage, a large probe was introduced through the fistulous opening which led into the temporo-sphenoidal lobe, and upon its withdrawal an additional quantity of pus escaped. Following this, the active symptoms promptly subsided, the patient making a slow but uninterrupted recovery. Bacon reports a case somewhat similar to the above.

The following interesting case came under the joint care of Dr. Francis Stewart and the writer, and illustrates our faulty methods of brain localization.

The patient, a Russian tailor, aged 24 years, was admitted to the Jefferson Hospital October 21, 1906. His parents, three sisters, and four brothers, are living and in good health, and there is no history of cardiac, renal, tuberculous or malignant disease in the family. He never had any of the diseases of childhood, although at one time during infancy he was exposed to severe cold, which may have been the cause of his ear trouble. At any rate he has suffered from a recurrent suppurative otitis media of the left ear from early childhood, the discharge at times being profuse, offensive and brownish-yellow in color.

About six years ago the discharge suddenly ceased, after exposure to severe inclement weather; pain and tenderness developed in the mastoid, together with redness and swelling of the over-lying skin. The physician who was consulted at the time, made an incision through the soft parts and evacuated a large quantity of foul-smelling pus, thus relieving the mastoid symptoms, but not apparently affecting the otorrhea. The general health has always been good and no history of venereal infection could be obtained.

Present Trouble.—As nearly as can be learned, the patient

had dull headache, malaise, and loss of appetite for two weeks prior to entrance to the hospital. Two days before admission the aural discharge disappeared rather abruptly, the left mastoid became tender and painful, and a dull unilateral (left-sided) headache developed. The following morning mental symptoms, chiefly of a homicidal nature, appeared, although the patient seemed quite rational at times. There has never been chill or vomiting.

On admission the patient was dull and apathetic, but not delirious, although very restless at times. The respirations were accelerated, the temperature 103 F., and the pulse 60. The bowels were constipated, and there was slight nausea. The unilateral headache was the only symptom which seemed to be annoying. The pupils were normal in size, equal and reacting to light. The tongue was thickly coated, the breath foul, and the fauces slightly hyperemic. The thoracic and abdominal organs were apparently normal. The left auditory canal was narrow and blocked with thick, foul pus. The skin over the mastoid process showed the effects of a blister which was applied by the attending physician, and a slight depression due to the former operation. There was slight tenderness on deep pressure towards tip, but no distinct swelling or redness. Upon cleansing the auditory canal, abundant pus of a foul odor was encountered. The entire membrana tympani, as well as the ossicles, had been destroyed, and there was a distinct drooping of the superior and posterior wall of the external auditory canal, and a carious opening leading through the same and communicating with the mastoid cells. Examination of the eye-grounds gave a negative result. The neurologic examination was also negative, save for mental hebetude. The urine showed no abnormalities.

The radical operation was performed by the writer, October 22, 1906. An old sinus was encountered above the mastoid, a little higher than the level of the auricle. There was some pus and much softened bone, removal of the latter necessitating exposure of a portion of the lateral sinus. After thoroughly curetting the middle ear cavity, the old sinus was enlarged with the chisel, considerable pus being evacuated after reaching the dura. The abscess cavity lay in the temporo-sphenoidal lobe and comfortably admitted the index finger above the second joint. It was washed out with salt solution and return drainage tubes inserted. A few silkworm-gut stitches were then

inserted above and below the exit of the tubes and the remaining space filled with gauze. After operation the head was elevated, stimulants administered, and elimination encouraged. Morphin hypodermically was needed on several occasions, as the patient was delirious and quite restless. Six days after this operation the patient began to show signs of cerebral compression.

A second neurologic report by Dr. A. Gordon is as follows: "The patient presents marked mental hebetude. It is difficult to arouse him. At times he would clear up, and then it is possible to make him execute some acts necessary for examination. Simple acts he would perform, but with delay. Complicated acts are not done by him because, I believe, of impaired comprehension. The physical symptoms are as follows: When told to raise his foot, he would first bend the leg over the thigh, and the thigh over the pelvis, and only then the foot. When told to raise his hand, he would first bend the forearm over the arm, and only then raise the entire limb. The phenomenon was present on both sides. The knee jerk is exaggerated on the right and diminished on the left. There is a slight Babinski on the left, but a distinct paradoxical reflex on the left. No ankle clonus on either side. The reflexes of the upper extremities are exaggerated. There is hyperalgesia in the lower extremities and hypalgesia in the upper. There is apparently no cranial nerve involvement, but this cannot be accepted as absolutely correct, as in view of his mental condition it was difficult to make the patient execute uniform movements at each test, either with his eyes or facial muscles. The tongue, however, protrudes to the right.

"In view of the irregularly distributed symptoms and chiefly because of the presence of the above phenomena in raising the foot or hand (asynergy), the cerebellum is probably involved."

The following day the pulse was 45, the temperature 97, and mental hebetude quite marked. As these symptoms increased during the following three days, exploration was decided upon.

Second Operation, by Francis T. Stewart.—The original incision was separated and the opening in the skull enlarged. After exploring the abscess cavity with a negative result, the scalp incision was carried backwards and downwards, and the cerebellum exposed with gouge and rongeur. The cerebellum

bulged into the opening, showing increased intracranial pressure, although the pulsation was quite evident, and no pus could be found with the needle and trocar, not even by an incision. The temporo-sphenoidal lobe was, therefore, again explored, and a satellite abscess, containing perhaps a dram of pus, discovered above and in front of the original abscess cavity, apparently separated from the parent abscess by a very thin wall of healthy brain tissue. A double drainage tube was inserted into this through the original cavity, and iodoform gauze placed over the cerebellum. Following the operation, the patient's condition was very poor, and he was given vigorous stimulation and saline infusion.

The following day, November 2, 1906, somnolency was marked, but the general condition somewhat better, rectal feeding was necessary.

November 4. He answered when spoken to for the first time since the second operation, and took food by mouth. The pulse was quite weak. The patient was extremely restless at times, and was unable to recognize his surroundings.

November 5. Fed through nose and by nutrient enemata. A little weaker.

November 7. Condition same.

November 8. Unable to speak, but noticed when spoken to. Hypodermoclysis. Sudden elevation of temperature.

November 9. Slightly better circulation.

November 10. Decline of temperature. Spoke some. Much clearer mentally.

November 12. Much improved. Answers questions. Wound discharge free and still foul.

November 14. Some slight signs of compression. Tubes carefully cleaned, and by November 15 patient much improved.

November 20. Patient got out of bed and walked about eight feet.

November 23 to 26. Patient irritable and noisy.

November 26. Morphin and hyoscin resorted to.

November 27. Patient clearer than ever before. Was able to tell and spell his name; spoke of business, etc.

The patient left the hospital about the middle of December and was seen only a few days ago, and has improved markedly, both mentally and physically, being able to return to work.

In conclusion, I wish to remind you that in the foregoing in-

teresting case, with the exception of the otorrhea, there was an entire absence of diagnostic symptoms suggesting either the nature of the brain lesion or its location. Had it not been for the fact that an old sinus was discovered, we would have been in absolute ignorance as to the exact location of the pus formation. Furthermore, had the temporo-sphenoidal lobe been explored in the usual way, it is unlikely that all the pus would have been evacuated, from the fact that the satellite abscess formation had already formed.

There was also an entire absence of either chill or vomiting.

Repeated examinations of the eyeground gave negative results, while the neurologic examinations were of little or no diagnostic value.

VIII.

THE DETERMINATION OF AURAL ACUITY BY MEANS OF THE WHISPER TEST.

BY PROF. H. ZWAARDEMAKER, UTRECHT.

TRANSLATED BY CLARENCE LOEB, A. M., M. D.,

ST. LOUIS.

Oskar Wolf, in his famous little book "Sprache und Ohr," 1871, was the first to suggest the testing of the hearing of normal and diseased ears by means of ordinary speech. As is well known he determined the distance at which a whisper should be heard. The whisper test very quickly took the place of the ordinary speech, since it was found that otherwise too much distance would be required. In addition, are the following reasons: (1) The greater equality of the whisper as far as accentuation is concerned. (2) The theoretical superiority of whisper, which is made up of pure tones without the quality of sound due to the vibrations of the vocal cords, which are foreign to speech.

However that may be, whisper is universally used as the test for hearing. As to the normal distance up to which it can be understood, the opinions are widely divergent. O. Wolf considered 18 meters as the normal distance, while the German military rule puts it at 23 meters. This should cause no wonder, for the result depends on the words chosen, in addition to the energy of the respiratory current and the distinctness of articulation, which is very different in different people. Mistakes are made in nasalized words, in soft and hard explosive tones and in *a* and *eu*; *r* is frequently not heard; *u* is considerably harder to understand than the clearer vocal tones. Among the consonants, *s* and the sharp *ch* are most easily heard. To obtain the correct valuation, an extensive, almost statistic, investigation is necessary, requiring a large number of confusing words and untiring patience. The valuation of the hearing obtained in this way, is 18 meters, Wolf's findings.

The lack of consistency in the results of testing aural acuity by means of whisper becomes viewed in a new light if the choice of words is undertaken in a *more systematic fashion*.

The possibility of doing this is furnished by an analysis of the sounds in different languages which was made last year by some physicists, physiologists and phoneticists. By means of speech-indicators and phonographs, analyses of vowels and consonants were made, which show the characteristic tone (the so-called formants) independent of the pitch of the vibrations of the vocal cords. The formants, it is true, are usually multiple for one and the same tone, and are then present in different intensity, but when once known, they are found to vary only slightly and are almost the same in high and low pitches.

The following tables give a view of the results heretofore obtained:

TABLE I.
HAUPTVOKALE. VOYELLES PRINCIPALLES. CARDINAL VOWELS.

AUTHOR	u	o	a	e	i	MOTS TYPES STICHWOERTER KEYWORDS
Pipping (Finnish)	g ² —b ² g	b ¹ —c ² a ² —c ³	f ² —fis ⁴ d ³ —dis ³	ais ¹ , a ² —c ³	dis ³ ; c ⁴	Hauskuus, kuopio, satama, taide, kiuri
Boeke (Dutch)	cis ²	c ²	c ³ —e ³	fis ⁴	dis ⁴	ver, loos, vader, meer, bier
Hermann (German)	c ¹ —f ¹ d ² —e ²	c ² —dis ²	e ² —gis ²	d ² —e ² ais ³ —h ³	e ⁴ —fis ⁴	
Sasswloff (Russian)	c ¹ —g ¹ c ² —e ²	b ¹ —dis ²	g ² —a ²	b ³ —dis ⁴	d ⁴ —e ⁴	
Verschuor (Dutch Dialect)	d ³ —dis ³	c ¹ ; g ²	f ² —fis ² cis ² —dis ³	b ³	g ² —a ² c ⁴ —dis ⁴	vulê: , o: vër; a: bram, heil, vli:hə.
Bevier (American-English)			d ² —gis ² c ³ —e ³			
Stevani (Italian)	d ¹ —a ²	d ² —d ³	e ² —e ³	f ² —c ⁴	c ⁴ —e ⁴	uno, scopo, ascia, pepe, tic
Delsaux-Quix (French)	fist ¹ ; g ²	b ¹ , h ²	c ² ; g ²	f ² ; c ⁴	c ³ —d ⁴	nous, mot, sas, cesse, type

TABLE II.
VOYELLES ANORMALES, NASALES ET NEUBRES
ANOMALE, NASALE UND NEUBRALE VOKALE
ABNORMAL, NEUTRAL AND NASAL VOWELS

AUTHOR	\ddot{o} (o) (eu)	æ (œu)	æ (un; eun)	a (an, en)	e, (ai, e)	e (in, ain)	\ddot{u}	o ¹	\ddot{a}	Mots types Stichwoerter Keywords
L'ipping	$b^1 - c^2$ $g^3 - gis^3$						a^3			\ddot{a} kayros, vüpyz
Hermann	$f^3 - g^3$						$a^3 - b^3$	$g^3 - a^3$ $b^3 - e^4$		
Ver- schrur	ais^1 $e^3 - a^3$						$gis^3 - b^3$	fis^3, g^3		$\ddot{v}öhöl, rüke, lac: lo,$
Delsaux- Quix	$\ddot{a}^2; f^3$	f ²	$h^2 - dis^3$ g^2	$c^2 - c^3$	$c^2; a^3$ $c^4 - d^4$					feu, feuf, un, an, fait, fin

TABLE III.
DIPHTHONGS

Author	ei	æ Dutch ui German eu	æ³ Dutch ou	ai	oi	Mots Types, Stichwoerter, Keywords
Verschuur			d², f³			au ; ə
Boeke	e², gis³, c⁴					v — u eis
Scripture				d¹, c³, b¹		T, fly
Delsaux-Quix					g², c³, c³	toit.

When these tables are studied, it is at once seen that the sounds are divisible into two large groups, each of which belong to one of the zones on the scale devised by me.

However, considering the results of the analysis, there seems to be a displacement of a mediant towards the treble of the original border between the second and third zones, which was assumed in the standard note (512 vib.) of the physicist. For practical reasons, it is desirable, in dividing tones into zones, to omit certain sounds; namely *v* on account of its relationship to *w*; *b*, *d* and *g*, because in strong accentuation they easily pass over into *p*, *t* and *k*; *j* on account of its relationship to *i*; *l*, which is sometimes spoken as an explosive sound and sometimes as a consonant; also, for the present, *ph*, concerning whose pitch in the different languages there is much dispute.

The other vowels, diphthongs and consonants have been arranged by F. H. Quix and myself into the following two groups:

(1) Sounds of lower pitch, from large $C-d^2$

(2) Sounds of higher pitch, from d^2-fis^4

The first group forms the *zona gravis* or bass-zone; the second forms the *zona acuta* or treble-zone. The tones of the same group are called *isozonal*.

In addition to the pitch, the intensity of the tone is of importance. The tones of the bass-zone have nearly the same intensity (loudness). They are, therefore, not only *isozonal* but also of equal intensity. The tones of the treble-zone are different, however, and are divisible into two rubrics, one consisting of those sounds heard at a moderate distance, and the other of far-carrying sounds. Grouping together those which are at the same time *isozonal* and of equal intensity, there are formed three natural groups of elements which have a similar acoustic value:

A. Sounds of slight intensity and lower pitch: *o, u, w, m, n, r*.

B. Sounds of higher pitch, heard at a moderate distance: *i, ü ei, au, f, t, k*.

C. High-pitched, far-carrying sound: *a, e, sch, c, z*.

The distance at which these sounds can be understood by normal persons are not the same for different languages:

	A	B	C	Author
Dutch	11 meters	22 meters	33 meters	Quix
German	20 meters	31 meters	44 meters	Reuter

By means of isozonal sounds of equal intensity, words can be selected which reduce to a minimum the power of the hearer to guess them, since the constituents of the word are enunciated with the same clearness. It is best to select monosyllabic words, because in polysyllabic words the accent of one syllable and the sounds forming it are more emphasized than the others. There are languages,* however, where there are no monosyllabic words found of isozonal sounds of equal intensity. Then, dissyllabic words must be used, whose parts are accentuated as nearly equally as possible.

Words composed of elements of equal value are heard at a less distance than the tones composing them. The principal reason is that the tone by itself, is always held longer than the same tone in a word. The sensation, in consequence of the longer duration, is more intense. In every language, therefore, it is necessary to make a special investigation of words composed of equal elements as to their carrying power. This was done in our laboratory, as follows: Dutch, by F. H. Quix; German, by C. Reuter; French, by V. Delsaux. For the Dutch, four nurses acted as hearers; for the German, Miss Reuter, and for the French, Prof. Toubeaux.

The following tables contain the results in the form of "Association Phonétique:"

*E. g., the Italian, as was shown in my laboratory by Dr. Stevani, February, 1904, while making a phonographic examination.

TABLE V.
CONFUSION WORDS FOR USE IN TESTING.

Dutch	roer, moe, roem, oor, room, oom, worm.		6
German	Uhr, Ruhr. Rum, Wurm, Moor, Mohr, Ohr, Rohr, Ohm, Rom.		8½
French	mou, nour, roue, eau, mot, nom.		9
Dutch		kick, tik, kik, tyk, feit, kyf, kei, tuk, tuf, fut, fout, kout.	14
German		tau, teut, tuck, toff.	18
French		tic, tuf, fai, feu, toi, foi.	19
Dutch		aas, zec, zes, esch.	30
German		schach. sechs, schiess, scheich, ass, see.	37
French		cesse, cher, chat, sèche.	30--35

TABLE Va.

CONFUSION WORDS FOR TESTING HEARING.

(Written in Association Phonétique.)

Dutch.	rur, mu, rum, o:r ro:m o:m worm		6
Ger.	ur, rur, rum, wurm, mo:r o:r ro:r o:m ro:m		8½
French	mu, nu, ru, o: mo: nom		9
Dutch.		ki:k, tik, kik, teik, feit, keif, kei, tyk, tyf, fyt, foot, koot.	14
Ger.		tau, toit, ty:k, tof.	18
French		tick. tof, fui, fo, twa, fwa.	19
Dutch.		a:s se: ses es	30
Ger.		sac, seks, si:s, saic a:s se:	37
French		ses, se: sa, ses.	30—35

For the phonetic translation, see

PAUL PASSY,

L'Ecriture Phonétique

Association Phonétique. Bourg la Reine. 50 centimes.

Collecting the results of this investigation, I should like to call attention to the following points:

1. Words can be selected composed of isozonal sounds of equal intensity, which are heard with equal intensity in all of their parts, where, therefore, guesswork is reduced to the minimum.

2. These words are especially suited for testing the aural acuity, because the words of the same group carry the same distance. This distance, of course, varies within certain limits, according to external circumstances (more or less distinct articulation of the examiner, aural acuity of the patient, construction and site of the place of examination). Under the same conditions, however, the words of the same group are heard at the same distance.

3. Unfortunately, the number of such words is very small in some languages. It would be very desirable to have a larger collection, but the number is entirely sufficient to test the aural acuity of all except simulants.

4. It is possible by means of this method to prove Wolf's belief in the existence of partial deafness. Both in normal people and in those with equal loss of hearing, there are found a number of 3 values which bear to each other about the relation of 1: 2: 4. If this is not true, the case is one of unequal loss of hearing.

IX.

A CASE OF CHRONIC SINUSITIS CURED BY INTRANASAL TREATMENT.*

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My object in reporting the following case is simply to present a rather striking example of chronic inflammation of the frontal and ethmoid sinuses and the antrum of Highmore cured without recourse to any external cutting operation. There was nothing original or novel about the method of procedure. It was simply a case of perseverance. Had the patient's general condition permitted, there is not the slightest question that a radical operation would have been advised as it was clearly indicated.

It seems to me that reports of cases such as these are particularly valuable at this time when enthusiasm is strong over external operations, especially the Killian, and when every rhinologist is so ambitious to add to the number of such operations that he has performed, that he may sometimes find it difficult to resist the temptation to do a radical operation on some case which, for one reason or another, were better treated in a more conservative manner.

If any of those here have such a case now under his care, he may derive some encouragement to persist in a conservative course from my experience.

Mrs. J. R. W., aged 64, came to me first in July, 1905. She stated that she had had a severe cold about five months before and that there had been a purulent discharge from the left nostril ever since with some frontal pain and tenderness. The pain was not so severe as to be unbearable, nor was it constant. The purulent discharge was rather profuse. Examination of

*Read at the annual meeting of the Eastern Section of the A. L. R. and O. Soc., Providence, R. I., January 5th, 1907.

the nose showed the septum thickened and deviated to the left causing considerable obstruction of that nostril, which was increased by the swollen turbinates, the middle turbinate remaining in contact with the septum even after being shrunk with cocaine, while creamy pus bathed both the turbinates. The patient's general condition was decidedly poor. She was a small, slight, delicate woman who had been somewhat of an invalid for a number of years. Her pulse was never less than 100 when she came to my office and she got out of breath very easily. The exertion of merely coming in the cars to see me exhausted her very much. Under these circumstances even the intranasal treatment could not be very protracted at each visit at first. Later, by directing her diet and making her live out of doors as much as possible, her general condition improved considerably.

Her left antrum was seen to be dark on transillumination and a puncture with a medium sized trochar was made through the inferior meatus and considerable odorless pus washed out. The antrum was washed six times in the next ten days with a normal salt solution containing about 4 per cent of boric acid. But there was no noticeable improvement. Realizing then that the ethmoid, and probably also the frontal sinus was affected, the next step was to remove by cold wire snare the anterior portion of the left middle turbinate which completely filled the upper portion of the narrow nostril and blocked the drainage from these sinuses. The patient was so much exhausted by her visits (it took her an hour to come from her home to my office) it was deemed best to give only one treatment a week. For the next three months, treatment consisted in washing out the pus which collected in the antrum and removing tissue from the ethmoid region with cutting forceps and curette. In the latter procedure I attempted to work in the directions from which pus appeared to come. By this time I had almost begun to despair of being able to cure the case by intranasal treatment. While the pain and tenderness was less, and the patient thought that the discharge was less through the week, the character and amount of pus showed little if any change since the first visit. But the general condition still precluding radical operation under general anesthesia, there was no course left but to abandon treatment entirely or persist on the same course as heretofore. As I have already partially indicated, this was to cocaine the more thoroughly by means of pledgets of

cotton soaked in an 8 per cent solution of cocain and then to further shrink the tissues by 1-1000 solution of adrenalin applied in the same way. The ethmoid region was then carefully wiped out and the source of any pus that was seen was followed up carefully with a probe and the diseased tissue in that region removed by means of cutting forceps and delicate curettes. Guided by the pus in this way I, one day, introduced the pfobe into the frontal sinus and following the same course with a small ring curette I removed considerable granulation tissue and enlarged the frontonasal duct. In using the curette in the duct I was careful to exert pressure forward and downward only. I then washed the frontal sinus with a mild anti-septic solution through a small silver canula introduced through the duct. This treatment was continued for the next three months at intervals of a week or ten days. The antrum was also washed at each visit. There was a gradual improvement during this period. The amount of pus washed from the antrum diminished and became more mucous in character. This was true also of the washings from the frontal sinus.

Frontal pain and tenderness had now disappeared. Occasionally after washing out the frontal sinus I injected a 70 per cent solution of alcohol. This was not painful and I believe was of benefit. During the next two months the patient was treated six times. She had come down from using a dozen or more handkerchiefs a day to only one and had little or no discomfort. There was still a moderate muco-purulent nasal discharge and a clump of muco-pus could generally be washed from the antrum.

About a month later she made her last visit. My notes say, "July 10, 1906, no pus in nose. Both antra and frontals transilluminate. The patient has no nose or throat symptoms."

A letter dated December 14, 1906, in answer to one of inquiry from me, says: ". . . I am glad to be able to tell you that your cure was complete. I have had no trouble from my head or nose, though I have, once or twice, had a cold which affected my throat considerably."

The treatment extended over a period of about one year, during which time the patient made forty-five visits.

X.

PAPILLOMA OF THE NOSE; A CASE OF HYPEROS- MIA; A CASE OF PANOTITIS COMPLICATED BY EMPYEMA OF THE NASAL ACCESSORY SIN- USES, WITH SEVERAL UNUSUAL FEATURES.*

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CASE I.—PAPILLOMA OF THE NOSE.

From the time of Hopmann's celebrated paper in 1883, the subject of nasal papilloma has been a fruitful source of discussion, especially from the pathologic standpoint. Dr. Jonathan Wright, a former member of this society, has done much toward the clearing up of this mooted question. Today it is generally recognized that what Hopmann described as papilloma was not a true papilloma at all, but, as Wright calls it, a papillary hypertrophy. True papilloma of the nose is an exceedingly rare tumor. Wright in his paper on the subject in 1891, while not pretending to exhaust the literature, and frankly admitting the impossibility of running down all the cases on account of the faulty nomenclature and the lack of a microscopic examination, was able to collect less than a dozen. Bosworth had seen one papilloma in 290 benign growths. We have not attempted to search the literature since 1891, but we do not recall seeing any case reported in recent years. On account of the rarity of the affection as well as because of sev-

*Read at the meeting of the Eastern Section of the American Laryngological Rhinological and Otological Society, Providence, Jan 5, 1907.

eral features not mentioned by writers on the subject, we desire to report the following case:

Dr. V., age 68, consulted me last spring, complaining of difficulty in breathing through the left nostril. He had always enjoyed good health, but felt that the difficulty in breathing, together with the habit he had acquired of using cocain to get relief, was pulling him down. There was no pain in the nose and he had not had nasal bleeding. Examination of the throat and nasopharynx was negative. Examination of the nose showed a papillary growth obstructing the left nostril and situated about 2 cm. inside the vestibule. The probe discovered that this was attached to the septum, to the floor of the nose and to the anterior portion of the inferior turbinal. Inspection of the right nostril revealed a small amount of a similar growth attached to the septum anteriorly. The growths were removed by the cold wire snare and curette and the bases carefully touched with the galvano-cautery. The microscope showed them to be true papillomata. The patient was seen during the month of December of last year. A slight recurrence had taken place in the left nostril on the septum alone. The patient was feeling in good general health.

A mark of distinction between the true papilloma and the papillary hypertrophy is the situation of the growth. The former is found in the anterior part of the nose, while the latter is confined to the posterior portion. With this rule our tumor corresponds. We have no record of a case where the growth was found in both nostrils at the same time. The possibility of a malignant tendency is mentioned by several authorities. In our case, this was considered on account of the age. There was, however, no suggestion of it. That it can occur is shown by the remarkable case of Verneuil in which the papilloma recurred in the larynx and bladder after removal and death finally resulted. Bosworth says that they are found in early adult life and more commonly in children. This does not apply in the case just reported, and on account of the haze which has hung over the diagnosis till recently, we question how much weight can be placed upon this observation. Our patient resembles the others reported in presenting no characteristic symptoms. The development of the tumor is usually a slow one and the only complaint is an increasing discomfort in breathing.

CASE II.—A CASE OF HYPEROSMIA.

Disorders of the sense of smell are not at all uncommon,

especially when they concern an impairment or abolition of that function, commonly known as anosmia. A great deal has been written upon both the pathology and the treatment of this affection which is generally regarded as an organic disease. Much less frequently met with are the pure functional neuroses involving the sense of smell. Of these parosmia or the perversion of smell is occasionally seen. Dr. Munger, a fellow member, read a paper on this subject, if we are not mistaken, a few years ago in which he gave some remarkable instances of such perversion. Hyperosmia or hypersensitiveness of the sense is an exceedingly rare disorder, at least as encountered by the rhinologist. In twenty years of professional work we do not recall seeing any but this case which we are about to report. Wherever mention is made of the disorder in text-books upon the nose, hysteria is given as a cause. This may explain why we see so few of these cases, i. e., that they are treated by the neurologist or internist.

Mr. K., age 57, banker, consulted me in November of last year giving the history that he had been a great sufferer for years because of his extreme aversion to odors. On inquiry it was learned that it was only certain odors which produced this distress, especially strong, cheap perfumes, cabbage and turnips when cooking and similar substances. These affected him so unpleasantly as to produce headache and nausea, with vomiting at times. Further questioning brought out a history of several attacks of neurasthenia as well as a chronic stomach difficulty, for which he had consulted Prof. von Norden during the preceding summer. He further stated that in the past when his stomach had been giving him especial trouble, he had suffered more from the nasal disorder. Examination of the nose showed a moderate degree of chronic rhinitis in the terminal stage. There was no complaint of nasal discharge or stenosis. No contacts of the turbinals with the septum were detected. A diagnosis of hyperosmia secondary to disturbance of the gastro-intestinal canal was made. Under gentle local applications of argyrol 25 per cent, combined with the use of the galvanic current direct to the nose, there has been a most satisfactory improvement in the condition. He has been warned, however, that any renewal of his stomach difficulty or another breakdown will bring on the disease again.

The pathology of this and allied functional disorders of the sense of smell offers a most interesting field for investigation.

A clinical report, as this alone pretends to be, is not the place for a consideration of this question. We would remark only that while they have been generally ascribed to hysteria, it is greatly to be doubted if that is the usual cause. Certainly this case clearly shows a gastro-intestinal origin for the complaint. What the true connection between the two is, whether it is in reality a reflex as is generally stated, or whether it is a form of toxemia expressing itself upon the olfactory nerve, we are not prepared to say. We know only that the extent of auto-infection from the gastro-intestinal tract has not yet been fully appreciated.

CASE III.—A CASE OF PANOTITIS COMPLICATED BY EMPYEMA OF
THE NASAL ACCESSORY SINUSES, WITH SEVERAL
UNUSUAL FEATURES.

We desire to frankly state at the outset that we are not at all sure that this is the proper title for the case which we are about to report. No case in years has proved more puzzling, and in many particulars, it is still not clear to us today.

Mrs. H., age 48, consulted us on August 28, 1905, giving the following history: She had always been well; never had had any trouble with the ears till the present attack. She had had several operations upon the nose, some years before. The difficulty with the ears began upon December 17th of the preceding year. (You will note that a definite date is given for the onset.) On returning from a small social gathering, she was seized with pain in both ears with intense vertigo and tinnitus. We have no record that she lost consciousness. The ears soon began to discharge. How soon after the beginning of the attack we do not know.

These symptoms, except the pain, have persisted in a greater or less degree till now. She complained particularly of a constant pressure in the back of the head. Treatment at the hands of several competent physicians by the usual methods of inflation and massage had given no relief.

Examination showed a well-nourished woman of fifty who was so deaf that she heard only loud conversation in front of the left ear. There was entire loss of the right membrana tympani; the canal was perfectly free from all secretion. The left membrana tympani showed two good sized perforations, one in the centre and one in the posterior upper quadrant. There was a slight amount of moisture detected by the applicator. No necrosis was discovered by the probe. The C tuning

fork was heard $7/15$ seconds in the left ear, which easily perceived the Civ by aerial conduction. A bilateral empyema of the ethmoid cells and of the both sphenoids was recognized, with polyp formation. A series of intranasal operations was performed which entirely relieved the empyema. At the completion of the operation of the sphenoid on the right side, the patient said I had struck the site of her pressure and dizziness. This was indeed greatly lessened by the operation. Gentle cleansing of the left ear caused the slight discharge to stop. There was a moderative improvement in the hearing in the left ear. On October 7th my records gave the tuning fork reaction as follows:

Left: C $\frac{3}{25}$, C ii $\frac{3}{7}$, C iii $\frac{3}{7}$, C iv $\frac{2}{3}$.
 Right: C $\frac{0}{20}$; C ii $\frac{11}{10}$, C iii $\frac{0}{2}$, C iv $\frac{0}{0}$.

Galton was nearly normal in the left ear at 6 inches. At this time the patient was put upon a saturated solution of potassium iodid, ninety drops a day. Under the use of this, there was a most gratifying improvement in the hearing.

The vertigo also was decidedly better. On December 29th I made a very gentle application of vibro-massage to the left side of the head. This I have used in many cases without the slightest unpleasant results. Here it had the effect of bringing back the vertigo in a severe form which lasted for a number of weeks. On May 10th of the past year she was hearing exceedingly well and complained only of a slight return of the pressure in the head. At this time I made a great mistake. Instead of being satisfied with the marked improvement which had been made, I yielded to her importunities, and seeking to employ what would be the most harmless treatment I could think of that might do good, I dropped a few drops of a 1-5000 solution of adrenalin chlorid in the canal of the left ear. At once the patient was seized with intense pain in the ear. In spite of all I could do, this pain persisted for a number of days. With the pain, vertigo returned, the ear began to discharge, and she became almost stone deaf. This deafness has continued ever since. No particular reaction could be seen in the ear, nor did the Eustachian tube show an inflammatory swelling, though at the first the pain was referred to that region. Later the pain was in the bone behind the ear and a mastoiditis was suspected. The Eustachian tube, it might be said, had been carefully studied. It was freely open at all times but to make doubly sure on a number of occasions we easily introduced a large bougie with-

out benefit. We desire to add that this solution of adrenalin had been used before in a number of cases without the slightest ill effect and was employed after this with equally innocuous results. The solution was perfectly clear in color. It will be noted too that the pain followed instantly.

We have called this case one of panotitis. The sudden onset, the profound deafness, the vertigo and tinnitus together with the results obtained by the functional tests, all point conclusively to an involvement of both the middle and internal ear. Panotitis, as described by Politzer, who first used the term, is the result of some severe infection such as scarlet fever or diphtheria. There is always a sudden loss of consciousness. This did not take place in our case. At least we have no record of it. As some eight months had elapsed when we saw her, this may have occurred for a short space of time and no mention of it made in the history given. What was the nature of the invasion in this case? This is a question of much interest. The idea of one specialist who saw her was that it was diphtheria. On what ground he based this view, we do not know. It is perfectly possible that some virus could have entered the ear through the blood or lymphatic system. There was, however, not the slightest indication in the history of any acute involvement of the nose or throat. Granted that this was the case, we feel strongly inclined to regard the long standing disease in the accessory sinuses of the nose as primarily at the bottom of the aural invasion. Whether the middle or the inner ear was the first to be attacked, it is impossible to say. As Politzer states, the onset may be so abrupt that the two are attacked almost simultaneously. The relief to the occipital pressure obtained by the intranasal operative work is very suggestive of the close nasal association of the affection. Most incomprehensible of all is the violent return of all the symptoms by the local use of the adrenalin. We have since learned of a somewhat similar effect of the drug in another case. We have tried to explain it on the ground of a personal idiosyncrasy and yet this is not perfectly satisfactory. We have wondered if there could have been a defect in the inner wall of the middle ear and that the drops had penetrated directly into the inner ear. We had, on previous occasions, employed a number of astringent and aseptic solutions in this ear without causing the least discomfort, as well as used the adrenalin freely on many occasions in the nose.

XI.

THE EXAMINATION OF THE THROAT IN CHRONIC SYSTEMIC INFECTIONS.*

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The object of the following paper is to present suggestions for examination of the throat which I have found of value in conditions of chronic systemic infection. With the more general recognition on the part of the general practitioner of the importance of the throat as an entrance point of infection, aid is more and more frequently sought of the laryngologist, in order to determine whether, in a given case, he can throw light upon the cause or origin of the general process. In the past twelve years I find, from a review of hospital and private practice, the largest number of such consultations relates to cases of cervical adenitis. Within the last year, many consultations have been held with orthopedic surgeons in cases of chronic arthritis. The question always asked is, "Does the throat account for the enlarged glands or is the throat the point of entrance for the infection of the joints?"

In answering these interrogations we must look beyond the question of whether the throat exhibits alterations visible to the eye. We must bear in mind both the normal and pathologic histology of the parts, as well as the nature of the special infection in question. We must distinguish between penetration of micro-organisms through the tissues of the throat and the absorption of toxins. In short, we must base our opinion, not only upon minute and painstaking examination of the case in question, but also upon an intelligent application of the related data in physiology and pathology.

Although a variety of infections probably enter the system through the throat, yet I shall confine my remarks for the pres-

*From the Boston Medical and Surgical Journal, November 29, 1906.

ent to tuberculosis of the lymph nodes and to infectious arthritis. In the study of the former infection the investigator is fortunate in possessing knowledge of the causative agent. If, therefore, we are able to follow here with accuracy the phenomena involved, we shall have a point of departure for the study of other diseases, where the cause and nature of the infection are less clear.

In studying the condition which the orthopedic surgeon terms infectious arthritis the investigator starts seriously handicapped. While clinical evidence appears to show that a state of infection exists, yet we do not know what the micro-organism is, or whether the disease is due to the actual penetration of bacteria into the body or to an absorption of their products into the system. Nevertheless, experience has repeatedly shown that the discovery and removal of a septic focus in this affection have been followed by more or less complete relief to the joint symptoms. Since the condition bids fair in the future to engross the attention of the laryngologist with increasing frequency, it behooves him to have as clearly as possible in mind what conditions of the throat are likely to constitute an infection atrium.

With regard, in the first place, to cervical lymphadenitis, the laryngologist has to determine whether the exciting cause is tuberculosis or some other irritant. I shall report briefly nine cases of this affection, where it was possible to study with comparative fullness the pathology and course.

CASE I. A boy, five years of age, seen April 2, 1904, in consultation with Dr. T. M. Rotch, had shown one year previously enlargement of the cervical nodes on the left side, subsequently diminishing. During the past month, several of the nodes again became enlarged on the same side, the largest reaching the size of a hickory nut.

Examination of the throat showed tonsils of normal contour and color, not enlarged or adherent to the pillars. The crypts presented no dilatation, and showed no evidence of retention of contents. A small non-obstructive pharyngeal tonsil was present. Under ether, both tonsils and the adenoid were removed. The left tonsil on incision showed a central collection of puriform material in a cyst-like cavity. Within a few days, the cervical glands on the left became larger and were removed.

The adenoid and left tonsil were examined microscopically

by Dr. J. H. Wright, and inoculation made into guinea pigs. The adenoid showed no evidence of tuberculosis under the microscopic, and inoculation into a guinea pig was not followed by tuberculosis. The tonsil showed giant cells and tubercles microscopically. Inoculation into a guinea pig was followed by tuberculosis of the spleen and lymphatic glands.

In January, 1906, the child was again seen. Since the operation he had been perfectly well, without a return of the cervical adenitis until three weeks ago, when a small mass appeared near the scar on the left, soft and elastic. Examination of the throat showed no sign of the left tonsil. Some small granules were visible on the posterior pharyngeal wall, and a certain amount of lymphoid tissue was found at the side of the right tonsil. The cervical nodes on the left were removed and found to be tubercular.

CASE II. Girl, two years of age, seen with Dr. Rotch, February 23, 1904. For the previous three weeks, elevations of temperature occurred every afternoon from 100 to 101, accompanied by gradual enlargement of nodes under left jaw. The child was fairly well developed and nourished. Several cervical nodes were found on the left, the largest being the size of a hickory nut, the others about the size of a pea. The left tonsil showed moderate enlargement with marked dilatation of the crypts, and evidence of recent rapid proliferation, characterized by irregular mamillated surface, with here and there protruding digitations of lymphoid tissue. The right tonsil was smaller and presented nothing abnormal. Both tonsils and considerable adenoid tissue were removed.

After this operation the temperature continued to run irregularly, and the cervical nodes on the left were removed in about two weeks by Dr. Dane. Several weeks later other nodes on the left enlarged and were removed. Since then the child continued to improve in every way, and remained well until May 1, 1906, when again the temperature exhibited afternoon elevations to 100 and 101 and two pea-sized nodules appeared near scar on the left side of the neck. Examination of the throat now shows no evidence of lymphoid tissue at the site of the left tonsil, and in other respects presents nothing to account for the adenitis.

The tonsils and adenoid were sent to Dr. J. H. Wright for examination. Tubercles and giant cells with bacilli of tuberculosis were found microscopically in the left tonsil and in the

adenoid. Inoculation of a guinea pig with the tonsil was followed by emaciation and development of tuberculosis over the peritoneum and in the retroperitoneal and mediastinal lymph nodes and the spleen. The lymph nodes of the neck showed typical tuberculosis, and a guinea pig inoculated with the caseous material from one of the nodes was killed six weeks later and showed tuberculosis of the lymph nodes.

CASE III. Child, six years of age, was seen March 7, 1905, with Dr. McKean, for cervical adenitis, and showed a large adenoid, with hypertrophy of both tonsils. Several cervical nodes on the right were enlarged, the largest being the size of an English walnut. Clinical examination of the tonsils presented nothing beyond simple hypertrophy. The crypts were not enlarged, and there was no evidence of retention in the crypts. The tonsils and adenoid were removed and inoculated into guinea pigs. The animals inoculated with tissue from the adenoid were found healthy when examined six weeks later, while the pig inoculated from the right tonsil showed extensive tuberculosis.

CASE IV. Boy, five years old, seen May 18, 1904, with Dr. W. J. Donahue, for right cervical adenitis of several months' duration. Child fairly well developed and nourished, cervical glands on the right enlarged to size of Lima bean; tonsils apparently normal; moderate adenoid. On operation, the right tonsil showed considerable cheesy material in the center; the left tonsil and adenoid presented nothing abnormal. In September of the same year the child was seen, and showed a clean, normal-looking throat, with slight diminution in the size of the nodes.

The right tonsil was sent to Dr. J. H. Wright for examination. Microscopic examination showed giant cells and tubercles. Portions of the tissue were inoculated in a guinea pig, which was killed five weeks later, and showed tuberculosis of the retroperitoneal and mediastinal nodes, the spleen, the inguinal and one axillary node. Tubercle bacilli were demonstrated in one of the lymph nodes.

CASE V. Boy, five years of age, seen April 23, 1904, with Dr. L. F. Vickery, for right cervical adenitis of two months' duration. The tonsils were slightly enlarged and adherent to the pillars, but otherwise presented nothing abnormal. A moderate adenoid was present. Both tonsils and adenoid were removed.

The specimens were sent to Dr. J. H. Wright for microscopic examination. A guinea pig was inoculated from the right tonsil and killed six weeks later, showing tuberculosis of the lymph nodes, of the spleen and of the liver. The guinea pigs inoculated from the adenoid and left tonsil did not develop tuberculosis.

One month later the cervical nodes became slightly smaller and continued during the next year to decrease in size. The child remained well until April, 1906, when a single node on the right appeared rapidly enlarged, and showed central softening. Examination of the throat showed no evidence of hypertrophied lymphoid tissue at the former site of the tonsils, and nothing otherwise abnormal to account for the enlargement of the node. The general condition of the child was excellent.

CASE VI. Girl, two years, seen December 5, 1904, with Dr. Rotch, showed moderate enlargement of the tonsils and adenoid, with slight swelling of the cervical nodes on the left, the largest being about the size of a small pea. No operation was advised at the time, but during the following winter, the child had several severe colds, with increase in the size of the tonsils and of the adenoid, the cervical nodes remaining about the same. Except for a moderate hypertrophy of the tonsils, there was no abnormality noted on clinical inspection, there being no dilatation of the crypts or evidence of lacunar retention. The right tonsil and adenoid tissue were sent to Dr. Wright, who reported on May 23, as follows:

"The guinea pig inoculated March 11 with a portion of a tonsil received that day, was killed today, May 23, and shows extensive tuberculosis, obviously originating from the point of inoculation. The guinea pig inoculated with the adenoid tissue fails to show tuberculosis. Microscopic examination of sections of the tonsil and adenoid does not show tuberculosis."

CASE VII. Boy, four years of age, seen with Dr. C. P. Putnam, January 15, 1906, for right cervical adenitis of four weeks' duration, without other symptoms. The child was well developed and nourished. There was a moderate adenoid. The tonsils were moderately enlarged, but showed otherwise nothing abnormal, there being no dilatation of the crypts or acute inflammation. Three cervical nodes on the right side were enlarged to the size of a hickory nut. No change was noted during the following week, and the tonsils and adenoid were then removed.

Histologic examination by Dr. Wright showed one tubercle in a section from the right tonsil, none in the left tonsil or adenoid. The right tonsil and adenoid were inoculated into guinea pigs. Six weeks later, the pig inoculated from the right tonsil was killed, and showed extensive tuberculosis of the inguinal lymph nodes and spleen. The animal inoculated from the adenoid showed no tuberculosis.

CASE VIII. A boy, seven years of age, was seen November 13, 1905, with Dr. A. H. Wentworth, for left cervical adenitis of two weeks' duration, following acute tonsillitis. The node was about the size of a pigeons' egg, firm and not tender. The tonsils were markedly enlarged, with dilated crypts, containing considerable puriform detritus. The acute tonsillitis had entirely disappeared. One week later examination showed no alteration in the tonsils or in the node. Both tonsils and considerable adenoid were removed.

Dr. Wright reported simply hyperplasia of the tonsils and of the adenoid. Guinea pigs inoculated from these organs failed later to develop tuberculosis.

On the day following the operation the cervical node was smaller and in two weeks had disappeared from palpation.

CASE IX. A girl, nine years of age, was seen March 7, 1904, with Drs. Rotch and F. B. Harrington, for left cervical adenitis, of four days' duration, associated with reddening and swelling of the tonsils. The cervical nodes were about the size of a hickory nut. On the following day, the tonsils were more swollen and redder, and showed a white spot on the right one at the orifice of a crypt. Cultures from this showed streptococci, but no bacilli of diphtheria. The cervical nodes simultaneously became larger and more tender. Three days later, the acute inflammation of the tonsils had disappeared, although these organs remained considerably larger than normal. Nevertheless, the cervical nodes continued to enlarge, and at this time had attained the size of an English walnut. The tonsils and a small amount of adenoid were removed. In two days the lymph nodes began to diminish in size, and within two weeks could not be palpated.

Microscopic examination of the tonsils by Dr. Wright showed simple hyperplasia. No tuberculosis was found in guinea pigs inoculated with material from the tonsils and adenoid.

These cases, therefore, demonstrate first that tubercular

cervical adenitis may exist in association with the presence of tubercle bacilli in the tonsils, with or without visible changes in these structures, and is not necessarily affected by the removal of the tonsils. Second, that a form of cervical adenitis occurs, accompanied by distinct enlargement and subacute or chronic inflammation of the tonsils, and disappears after their excision. In the first instance, it appears reasonable to assume that a penetration of tubercle bacilli through the tonsils into the lymph glands has occurred; in the second, that an absorption of irritating material generated in the tonsils is taking place from them into the adjacent lymph nodes. In the latter instance, the removal of the focus of toxin production is followed by immediate relief.

Theobald Smith has shown that in cattle the bacilli of tuberculosis may enter the system through the mucous membrane of the mouth or throat, into the associated lymph nodes, without leaving any traces visible to the naked eye or discoverable by manipulation.

In seeking now to discover in what manner this penetration takes place we turn naturally to the experiments which have been made with regard to the behavior of foreign substances in contact with the epithelium of the tonsils. It is sufficiently established that penetration of dust and similar inanimate matter is continually taking place through the lacunar epithelium. It has not, however, been shown that such a penetration can take place through the relatively stout epithelium of the pharynx, and, indeed, microscopic inspection of the closely oppressed cells in these regions renders such an occurrence improbable. Whether the penetration of inanimate matter can take place through the lymph follicles of the pharynx is not determined, but at least one inhibiting factor may be mentioned, namely, the constant irrigation of these structures by the fluids of the mouth during deglutition, which will prevent a given particle of dust from remaining long over the intercellular spaces of the epithelium. This factor likewise exists in the case of the lingual tonsil, with its short, straight, and relatively wide lacunæ.

Although on theoretical grounds such an absorption is not likely to occur through the follicles of the pharynx or of the lingual tonsil, nevertheless, clinically, we know that at times, though rarely, certain micro-organisms may invade these structures, apparently in a primary manner. These infections

appear to be due chiefly to streptococci, and give rise to acute inflammations of the follicles of the pharynx or of the lingual tonsil. I do not know that primary infection of these structures by the bacilli of tuberculosis has been recorded, although secondarily, where the vitality of the mucous membranes has been greatly depreciated, such lesions are not uncommon.

Our knowledge in regard to the behavior of dust on the lymphoid tissue of the nasopharynx is less complete than in the case of the faucial tonsils, but by analogy there would seem to be no reason why the same phenomena should not occur, in spite of certain differences which immediately suggest themselves, such as the relative paucity of micro-organisms, the dependent position of the lymphoid tissue, and the shape of the lacunæ, which do not favor retention of foreign substances, and the small amount and different composition of the irrigating fluid. It does not, however, seem necessary to consider the pharyngeal tonsil separately and we may, therefore, omit it, for the present, from consideration.

Returning, now, to the faucial tonsils, observation shows that bacteria, while numerous in the crypts, are not ordinarily found below the surface of the lining epithelium, being apparently arrested by some agency which prevents their penetration. Whatever the nature of this agency, it is undoubtedly at times suspended, as I have shown in acute cases of tonsillitis, with the result of producing infection within the follicles or suppuration of the circumtonsillar space. It seems reasonable to assume that bacteria, if they enter at all, will enter by the same path which inanimate matter has found most easy, namely, through the lacunar epithelium, rather than through the more impervious membrane in the vicinity. Furthermore, the crypts of the tonsils constitute more or less sheltered harbors, where bacteria may linger, unaffected by the stream flowing past outside their orifices.

On the foregoing hypothesis it is evident that, other things being equal, bacterial infection through the throat would be favored by an increase in the size and number of the intercellular spaces of the lacunar epithelium and by the retention of the contents of the crypts. We have now to consider under what circumstances such favorable conditions for infection may be found.

With regard, first, to the character of the lacunar epithelium, examination shows that the number of the intercellular spaces

is proportionate to the amount of emigration of lymphoid elements from the follicles. Since such an emigration stands directly in relation to the proliferation present in the tonsils, it is chiefly in tonsils undergoing rapid proliferation of their elements, or in those which have attained a considerable degree of hypertrophy, that a loose character of the epithelium is chiefly marked. It is, therefore, found mostly in the young, or in older individuals where proliferation is maintained by one cause or another.

On the other hand, as I have shown in studies on the retrograde changes of the faucial tonsils, where atrophy of the follicles is marked and proliferation correspondingly decreased, the lacunar epithelium in the vicinity partakes much more of the stout, compact type covering the free surface of the organ. In other words, the tonsils under these circumstances would theoretically prove a more efficient barrier against the penetration of foreign substances.

Retention of lacunar detritus and opportunity for the development of bacterial activity will naturally be afforded by a narrowing of the orifices of the crypts. Such constriction may take place as the result of cicatricial contraction arising from previous acute inflammation or by adhesion to the tonsillar folds or the pillars in the vicinity or by process of retrograde metamorphosis. If the occlusion of the orifice of the crypt is complete, a cyst-like cavity will be formed. If this cavity is free from bacteria, it will exert no further influence upon the system, except, possibly, through pressure. If, however, the occlusion is not complete, but permits the entrance of micro-organisms, those which are saprophytic will effect a decomposition of the lacunar contents, while those of pathogenic property may be permitted to live, multiply, and await favorable opportunity for entering the system.

Such a condition of affairs may usually be perceived clinically by the presence of cheesy masses in the tonsillar crypts, or in the supratonsillar fossa, or between the tonsil and the pillars, especially the anterior pillar. These are seen microscopically to consist of desquamated epithelium, both living and dead leucocytes, bacteria and, at times, even particles of food. Clinically, this condition is characterized to a greater or less extent by evidences of toxic absorption into the system, as evidenced by pallor, impairment of strength and spirits, fetid odor of the breath and gastric disturbances of various

kinds. It is, therefore, probable that the two chief anatomic factors favoring infection may be found in the looseness of the lacunar epithelium, prior to retrograde metamorphosis of the follicles, and in the retention of lacunar detritus.

With these facts now in mind, we are in a better position to answer the question whether in a given case the throat is responsible for an infectious process elsewhere. It will be seen immediately that the average tonsil may be an entrance point for infection without essential deviation from the normal type, either in size or other pathologic alterations. Our consideration must not only regard the strength or weakness of the supposed point of attack, but also the nature of the invader, and the resistance on the part of the host.

Tubercular cervical adenitis is essentially a disease of the young, and, as these cases have shown, may enter any tonsil, even of normal appearance, provided the micro-organisms are present in the throat and suitable predisposition on the part of the host exists.

Non-tubercular cervical adenitis from absorption of toxins produced in the tonsils would, theoretically, be accompanied by visible alterations in the latter characteristic of lacunar retention. This occurred in cases IV and IX, and is confirmed by many instances which have come under my observation.

In chronic infectious arthritis, we have, as yet, but scanty data, and more will be eagerly awaited. If it be true that this affection is due to a specific micro-organism, it would seem probable that it is constantly about us, as in the case of the pathogenic micro-organisms. In this event it is possible that bacterium may be more or less constantly present in the mouth, and that certain individuals are peculiarly susceptible to infection by it. On theoretical grounds it would seem more reasonable to assume that such predisposition is a primary factor in its causation, rather than that a certain state of the throat may permit of its development in any individual.

Given, however, systemic predisposition, local vulnerability would become of importance in determining an attack, and we are, therefore, impelled to seek for the place of diminished resistance. While the point of infection may occur in other regions than the throat, yet if these can be eliminated we should look carefully in the tonsils for such conditions as have been described.

Following out this line of thought we may say that the

arthritic individual predisposed to rheumatic infection finds in the administration of certain remedies, or in the restriction of his diet, means for resisting infection, or in controlling the development of micro-organisms after admission. The examination of a large number of cases of infectious arthritis, with regard to the conditions of the throat, has demonstrated the existence of pathologic alterations in the tonsil characterized in general by retention of lacunar detritus, with or without hypertrophy of the organ. Since, however, inspection and careful clinical examination may fail to disclose deep-seated collections of detritus, communicating by circuitous passages with the open air, it seems to me wise, if other points of infection can be eliminated, to extirpate the tonsils in the most thorough manner. We shall thus replace a tissue of diminished resistance by a stout barrier of compact structure without nook or recess to harbor a pathogenic parasite * *

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XII.

EPITHELIOMA OF THE EAR.*

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Epithelial growths of the ear are rarely met with in private practice and but little more commonly encountered in our special clinics. Some data regarding their occurrence in hospitals are later given.

The relative frequency of occurrence of carcinomatous growths of the ear compared with those of other parts of the face is interesting; data having relation to this point are also herewith furnished.

The annual reports of the Brooklyn Eye and Ear Hospital show that before 1892, epitheliomata were not distinguished, in listing, from other tumors of the auricle. From 1892 to 1906 twenty-one (21) cases have been treated there. The Manhattan Eye and Ear Hospital Reports contain a much smaller number. In 1885 and 1886 one case each year was listed; since, none. The New York Eye and Ear Hospital listed in the years 1897, 1898, 1899 one case each year. The Harlem Eye, Ear and Throat Infirmary listed a case in 1905. The New York Skin and Cancer Hospital Report for the year 1904 listed the following cases of epitheliomata of adjacent regions: of the face, 28; lip, 22; nose, 8; ear, none. In 1905: of the cheek, 2; eyelid, 6; face, 22; forehead, 1; lip, 23; mouth, 2; nose, 9; ear (carcinoma of ear), 2.

Epitheliomata of the external ear are characterized by very slow development, perhaps the slowest of any region of the body. The considerable amount of cartilaginous structure in the external ear is no doubt responsible for this. Even more than of other parts of the head, epitheliomata of the external ear seem susceptible of successful and complete eradication. A very advanced case of the writer's, which was causing much pain, foul odor and disfigurement, was eradicated. Suc-

*Read at a meeting of the Brooklyn Pathological Society, October 11, 1906.

cess would seem especially likely if seen and treated early. The reason is probably the same as that given above, as the cause of their very deliberate extension, namely, the amount of cartilaginous tissue in the external ear; also because of their accessibility and consequent ease of complete eradication, when confined entirely to the external ear.

One case seen by the writer was stated to have existed for thirty-five years. Another for a nearly equal time. Two cases, which had reached an advanced stage, presented raw, suppurating ulcers with surrounding tumefaction and induration. Two on the other hand showed only deeply ulcerated, suppurating surfaces.

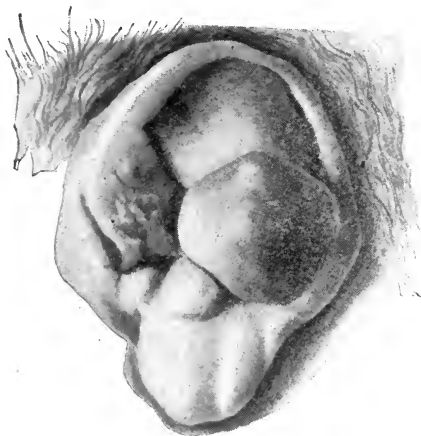


Fig. 1, Case I.—Epithelioma of external ear. Drawing made from amputated ear, upper part restored. The projecting mass was more globular than the drawing shows, the formalin preservative produced a somewhat irregular surface from shrinkage.

The most common point of origin is at the upper portion of the helix, according to Politzer.¹ Epitheliomata originating in the auditory canal seem to be of great rarity. The writer has seen a case through the courtesy of Dr. B. C. Collins, in a young man of 19 years which was pronounced by a pathologist to be an epithelioma. This case was treated for a long time by a practitioner with apparent success, but the Doctor has recently learned of its return.

The immediate causation of morbid growths of the external ear is not often apparent. One of the cases here figured was

due to prolonged irritation from a piece of roughly bent wire used in place of a spectacle frame.

Cancer originating in the middle-ear is, on the other hand, always due to one cause, namely, long-continued middle-ear suppuration. One case of this nature has but recently come under my observation.

Cases of cancer beginning in the middle-ear must soon extend to the canal, whence they may attack the parotid gland, tongue, jaw or accessory cavities of the nose, orbit and cerebrum. Cancer may involve the middle-ear by extension from adjacent structures. Some light on the origin of cancer of the ear has been given by P. G. Unna in his work on the skin. He de-



Fig. 2, Case I.—Drawing of microscopic section, cut horizontally through base and body of the projecting, globular mass.

scribes an affection occurring in men who spend their lives at sea, or constantly exposed to sun and wind, under the name of "sailor's skin." Pathologic changes occur in the parts of the skin most exposed. The condition noted in sailors and longshoremen he describes as follows: "At first there appears on the ears, the adjacent parts of the cheeks and temples, the backs of the hands and fingers, a diffuse cyanotic redness, similar to that due to frost. Then the skin becomes mottled, spots

of pigment, sometimes reticulated, becoming evident. The islands of skin between them partly lose their pigment." Ulcers form which extend laterally, the epithelial proliferations finding a hindrance in the dense plasmomatic cellular infiltration beneath, which strives to encapsulate it. From this ulcer, as from every "flat" cancer, there develops an ingrowing spreading one. Specimens of tumors at this stage were obtained both from the ear and the eyelid.² Epithelioma of the external ear is first noticed by the patient as a scab or small "sore" which very gradually increases in size.

Pain is a variable symptom. It has been found practically absent in one case of very advanced growth. In another some-



Fig. 3, Case I.—Photograph made shortly after amputation, while granulation was proceeding. A tag representing the upper part of the ear drawn downward and stitched to cut edge of posterior incision. By an error in printing the photograph the face is reversed, appearing as the right instead of the left side.

what similar case seen by the writer pain was very marked. It seems to be a marked feature only at advanced stages of the disease. In one case, the severity of the pain alone was the symptom which drove the patient to seek relief. In this case its intensity seemed due to the interference occasioned with the return circulation. In the case of epithelioma of the canal, the growth was the seat of more or less constant pain.

DEFORMITY. In one case of the writer's a considerable portion of the lobule sloughed off *en masse* as the pedicle of skin which held it became gradually thinner, thus finally becoming self-amputated. Swelling and deformity of the ear may be slight, or reversely, very marked. In a case seen, but

not here figured, the growth was but a shallow ulcer of the concha which had existed with but slight extension for many years. Another case was the reverse of this (Fig. 1). A remarkable tumefaction existed having at its most prominent part the appearance of a large, smooth sebaceous cyst, with unbroken surface. In front of this swelling and also on the posterior aspect of the ear were tumefied, suppurating ulcers. The writer regards the presence or absence of tumefaction to be largely due to the degree of interference with the circulation which the growth causes.

The history of the writer's cases is briefly given herewith.

Case I. P. H., aged 71, had a growth on his ear for twenty years. Latterly it had increased in size and had become very



Fig. 4, Case II.—Photograph of epithelioma involving tragus, helix, anti-tragus, concha, lobule and auditory canal.

painful. Its appearance was somewhat remarkable, differing entirely from any others previously observed, yet exhibiting under the microscope, as it proves, the characteristic details of tumors of its class. (See microscopic section, fig. 2.)

On the posterior surface next the attachment to the head was a suppurating ulcer. Externally a large, smooth tumor projected for a distance of nearly an inch from the normal plane of the ear, and resembled somewhat closely a sebaceous cyst. The ear proper was dull, purplish red in color, apparently from congestion due to interference with the circulation. The canal was entered only by the smallest probe and contained pus. No enlarged glands were discovered. The ear was amputated with the exception of a portion of the helix, the upper extremity of which was cut straight across with scissors, then brought down to the edge of the wound where it was stitched to the

healthy skin edges. The remaining raw surface was drawn somewhat together with stitches, and allowed to heal by granulation. The healing was rapid and uneventful. The pain was entirely relieved from the day of operation, and it is thought a better cosmetic result was obtained by retaining the upper portion of the helix than would have been the case with removal of the entire ear.

Case II. W. Scott, 75 years old, under observation at the Brooklyn Eye and Ear Hospital, six years ago for nearly a year, and a skilled workman on coast-defense artillery. A man of unusual physical strength when in his prime. No history of syphilis. He attributed the cause of the "sore" on his ear to the use of a bit of coarsely twisted wire on his ear, to hold



Fig. 5. Epithelioma of ear, confined almost entirely to the anti-helix. Reproduced through courtesy of Dr. Lutz. Case III was closely similar to this.

his spectacles in place. The growth involved the canal, tragus, helix and concha. The lobule, which in the picture shows a partial separation, later sloughed completely off. He declined surgical interference, and the conservative remedies applied did little but afford slight temporary relief, until he passed from the writer's observation.

Case III. A thin man of 80 years. The cancer was an ulcer depressed below the surrounding surface, involving the concha and crus of the helix. It caused him no pain. The edges of the ulcer were clearly demarked, and there was a slight amount of suppuration. He stated it had existed over thirty years. He seemed likely to outlive its very slow development. He appeared at the hospital but once.

Case IV. Miss A. C., 48 years. The following rare history illustrates one of the possible results of prolonged middle-ear suppuration. Since childhood up to five years ago patient has had an otorrhea from the right ear with occasional attacks of pain and concurrent increase of discharge. Five years ago she consulted the writer, who instituted a course of treatment for its relief, but finally, satisfied that a cure was not otherwise possible, he advised a radical operation. This was performed in the usual manner, entering the mastoid and antrum, and enlarging the auditory canal so as to make of all one cavity. After the usual subsequent treatment the discharge ceased. She was advised to report if everything was not as it should be. She returned in March, 1906, stating she had had pains for three months and a recurrence of the discharge, but hoping each day it would be relieved spontaneously, as her attacks of earache previous to the operation had been, she had neglected to return promptly. The ear appeared much as when last seen. A very scanty discharge now existed, however. She had no elevation of temperature. Her pulse, always remarkably slow, was but 60.

In the depth of the meatus was a fairly large, firm mass of granulations or what was then regarded as such. This was cauterized with the expectation that a prompt disappearance of the granulations would take place. On the contrary the severity of the pain increased and, fearing intra-cranial trouble, we advised an operation on the ear again. The whole mass was excised. The bone of the tympanic roof was soft and was freely curetted, exposing the dura in an oblong area of perhaps an inch by an inch and a half. On recovery from the anesthesia her face was carefully noted for signs of facial nerve injury, but motion was perfect at this time. On the second day, however, a slight degree of facial paralysis appeared and slowly progressed. Potassium iodid was given, but was so badly borne that it was soon discontinued. The pain, too, had not in the least been relieved. Not until now did we suspect that we had a malignant growth to deal with. Specimens of the growth from rapidly sprouting granulations confirmed our suspicions. Six weeks from the time of operation a swelling of the corresponding cheek suddenly appeared and she could only with difficulty open the mouth. Granulations were vigorous in the canal. The swelling of the cheek finally pointed and, in hope that some relief to pain might be

secured, it was incised. The abscess cavity did not involve the joint nor the parotid gland. The granulation removed from the ear rapidly reformed. The incision supplicated freely and was at times offensive. The sprouting of granulations continued from both wound and canal. The swelling of the face became no greater, but rather less. The edge of the post-auricular wound became bluish and unhealthy. Pulse, which had previously been slow, became rapid and weak. An unpleasant salty taste (pus), which she had complained of since the opera-



Fig. 6. Epithelioma of middle-ear. Picture shows swelling of cheek and the facial paralysis at advanced stage.

tion, was more troublesome and the irrigations of the canal also ran into the throat at times. The pain was severe and required the taking of morphia to control.

Injectations of Coley's serum of the toxins of erysipelas and bacillus prodigiosus were begun. She finally became so weak as to be practically confined to bed.

The effect of the last operation was thus unfortunate and seemed to hasten the development of the growth rather than retard it. Dr. Winfield tells me of one case of middle-ear epithelioma apparently successfully treated by the X-ray.³ The treatment of this case by Coley's serum has been undertaken as

a last resort, though cases of epitheliomatous cancer in advanced stages have been reported successfully treated by the serum.⁴ The deeply seated locality of a malignant growth in the middle-ear practically precludes the possibility of complete extirpation. Dr. Knapp⁵ reported a case of malignancy of the middle-ear some years since, which rapidly progressed to a fatal termination after attempts at its removal had been made by well-known surgeons and himself. Assaky,⁶ Kipp⁷ and numerous others have reported similar results.

As regards prognosis, epitheliomata of the external ear and the middle-ear thus differ to an extreme degree. Those confined to the external ear, even of an advanced type, may yield readily to surgical intervention. A cancer of the middle-ear, confined within a bony framework and springing from the ear structures, certainly gives the surgeon but little chance of interference with the knife. In the case reported, operation seemed to stimulate its activity. The X-ray or Coley's fluid seems to offer a possible method of cure, though Coley's method and the X-ray are regarded as having their largest fields of usefulness or the greatest likelihood of success in malignant tumors of other classes than epitheliomata. Fortunately, however, both these offer some hope of success, the case I have mentioned as treated by the X-ray and some cases of epithelioma successfully treated by Coley's fluid being examples. While Politzer recommends the galvano or lunar caustic in circumscribed cases of cancer of the external ear, I regard the knife as preferable in all but the most circumscribed. In Case II, where we were forced to use caustics, it was not successful. In cases where partial or complete amputation of the ear is necessary an artificial ear can be made. Tiemann does this work in a thoroughly artistic manner.

Incidentally the last case emphasizes a fact which the ear surgeon has had so frequently to urge, that the otorrhea of childhood are capable of producing many untoward results, if neglected, and that no effort should be spared to bring about a cure at the earliest possible time.

XIII.

SOME POINTS IN THE DIAGNOSIS AND TREATMENT OF LARYNGEAL CANCER.*

BEING AN INTRODUCTION TO A DISCUSSION HELD IN THE MEDICAL SOCIETY ON JANUARY 28TH, 1907.

BY SIR FELIX SEMON, K. C. V. O.,

PHYSICIAN EXTRAORDINARY TO HIS MAJESTY THE KING.

MR. PRESIDENT AND GENTLEMEN :

When in 1881, on the occasion of the International Medical Congress of London, a discussion took place in the Subsection for Laryngology on Malignant Disease of the Larynx¹, the outlook with regard to the treatment of this formidable disease appeared very dark indeed. Intralaryngeal operation had been universally abandoned on account of its want of success; thyrotomy had been completely given up after the anathema pronounced upon this operation for the cure of malignant disease of the larynx three years previously by Professor Paul von Bruns² and the result of partial and of total extirpation of the larynx—operations then only recently introduced—had so far been anything but encouraging.

To-day, just about a quarter of a century after that discussion, I shall be able to unfold a very different tale before you. If, in accordance with the now general custom, we divide all cases of cancer of the larynx into two large groups—the extrinsic, which comprises those cases in which the disease starts from the epiglottis, the aryepiglottic folds, or the esophageal aspect of the larynx, and the intrinsic, amongst which are included the cancers originating within the laryngeal cavity proper—it will be seen that nowadays the latter category, if only early enough diagnosed and thoroughly operated upon, gives a better chance for recovery and freedom from recurrence than cancer in almost any other part of the body, whilst the extrinsic variety, although vastly different from the in-

*From the British Medical Journal, February 2, 1907.

trinsic with regard to the extent of the operation, the mortality from the surgical interference itself, the prospect of recurrence, and the amenity of life afterwards, still shows distinct progress over the results obtained twenty-five years ago.

In a paper merely intended to serve as an introduction to a discussion it will, of course, be quite impossible to travel over the whole vast field of cancer of the larynx and to do full justice to the work of all those who have helped to bring about a better state of things. To-night I merely conceive it to be my duty to take stock, as it were, of the present state of the question and to dwell more particularly on some points concerning the diagnosis and treatment of cancer of the larynx on which no consensus of opinion has yet been obtained³.

Let me briefly repeat, then, what I stated in 1897⁴, and what has recently been acknowledged by Professor Paul von Bruns⁵, namely, that the improved state of matters is not so much due to the progress of our surgical technic, great and undeniable as this has been, as to the progress made with regard to the early diagnosis of malignant disease of the larynx.

If any one will take the trouble to look up the chapters devoted to cancer of the larynx in the textbooks of medicine, surgery, and laryngology published prior to 1888, he will find that the information given with regard to the symptomatology and the laryngoscopic signs of the early stages of malignant disease is extremely scanty, often inaccurate, and in not a few instances obviously more the result of theoretical construction than of actual observation. When, during the illness of the then German Crown Prince, the deplorable doctrine was promulgated that benign growths of the larynx showed a special proclivity to malignant degeneration after intralaryngeal instrumentation, I devoted, in the collective investigation which demolished that doctrine⁶, a special chapter to the description of the early signs of malignant disease of the larynx. It is the less necessary for me to enumerate these signs to-night, as after a period of initial doubt and scepticism they are now generally acknowledged to be true and trustworthy, and have found their way into practically all modern textbooks. There is, however, one of them, the most important one, which has, as I know from practical experience, given rise to an equally curious and serious misunderstanding, which ought to be corrected on an occasion of this character.

Amongst other laryngoscopic signs which ought already at an early period of the existence of the new growth to draw attention to the possibility of its being malignant, I stated that none was more important than defective mobility of the affected vocal cord. This defective mobility, I particularly emphasized, manifested itself in some cases early, in others at a later period. Although this description seems plain and unambiguous enough, the curious misconception has arisen in some quarters that if this sign was absent in an otherwise suspicious new growth, the contingency of malignancy could be excluded. It seems hardly necessary to say that this inversion of my statement is absolutely inadmissible. Nowadays one gets to see a good many cases of laryngeal cancer at a very early stage—that is, when an otherwise inexplicable hoarseness forms the only noticeable symptom, and at that time the infiltration of the mother soil need not be advanced enough to cause troubles of mobility; and, secondly, seeing that in the larynx, as in any other part of the body, some cancers for a long time are of a more surface character than others, and begin to infiltrate the tissue from which they spring only at a comparatively late period, it is, of course, quite inadmissible to exclude malignancy in an otherwise suspected laryngeal growth for no other reason than that the affected cord showed no signs of defective mobility when the case came under observation. However, to prevent any further misunderstanding, I now wish to formulate the rule as follows:

“If the vocal cord from which a suspected laryngeal growth springs shows at an early period of the disease a defect of mobility other than due to mechanical impaction of the growth in the glottis on phonation, this sign is almost pathognomonic for the malignant character of the tumor. If, however, this sign should yet be absent when the case comes under observation, such negative evidence does by no means exclude possible malignancy.”

It will have been observed that in the last sentence I stated that the presence of the defective mobility under such circumstances was “almost” pathognomonic. It is with good reason I express myself thus cautiously. For it must be sorrowfully admitted that, whilst the signs stated by me in 1888, which so far as I know practically form the last word upon the question of early laryngoscopic diagnosis, will be found

sufficient in the very large majority of cases to arrive at an early time at the correct diagnosis of malignant disease, they by no means do so invariably.

In fact, Mr. Butlin's dictum, pronounced about 'twelve years ago⁷.

"There are three classes of cases: the first in which any one and every one can make the diagnosis; the second, in which only the better instructed and more experienced make it, and others do not; and the third class, in which the conditions are so obscure that no one can make the diagnosis unless the larynx is opened, and in some of which it is even then difficult to make sure of the nature of the disease"—

is as true today as when it was first enunciated. It is not only benign growths, tuberculous and syphilitic tumors and ulceration, perichondritis from different causes, the differential diagnosis between which and malignant disease of the larynx is occasionally excessively difficult or even almost impossible by mere naked eye inspection, but there are some weird and outlandish conditions, which may simulate cancer or sarcoma, which are not described in any textbook, and which really cannot be expected to come within the thoughts of the observer. Thus I have described a case in which a globular blood clot completely enveloped what ultimately turned out to be an epithelioma; in another case seen with Mr. Butlin the tumor was found to be a leucoma instead of the suspected epithelioma; in a third instance seen with the same experienced observer, an effusion of blood into a vocal cord closely simulated the appearance of malignant disease. In a case demonstrated before the Laryngological Society⁸ not only the laryngeal tumefaction but also the general infiltration of the cervical lymphatics, which by four experienced observers had been considered as malignant, spontaneously disappeared after simply tracheotomy. In yet another case, which I repeatedly demonstrated before the Laryngological Society of London⁹, an obscure chronic ulceration occupying almost the whole left vocal cord of a gentleman aged 60, which had been suspected to be either tuberculous or malignant, and concerning the nature of which the views at the meeting of the Society considerably differed, ultimately disappeared spontaneously after having been in existence for two years; and to-night again I have to bring before you another extremely obscure case of laryngeal tumefaction—the

second of the kind in my experience—in a recent thyrotomy case of mine, which I regret to say ended fatally on the day after the operation from acute edema of the lungs.

The naked-eye appearances of the tumor, which from its smooth surface was not suitable for the removal of a fragment for microscopic examination, neither on laryngoscopic examination nor when the larynx had been opened, left the least doubt in the minds of those present at the radical operation (Dr. Watson Williams, Mr. Stabb, Mr. Tyrrell, a medical friend of the patient's, and myself) as to the malignant nature of the growth, particularly since the left half of the larynx was almost completely fixed. Yet when the specimen had been forwarded to Mr. Shattock I received to my greatest surprise a report from him in which he stated that there was no carcinoma nor other form of malignant growth, but merely small-celled infiltration of the mucosa, nowhere extending into muscle or even to the glands, which were very numerous in one piece. The glands in all three pieces were quite normal, as was the tissue in which they lay; so was the muscle. A papillary up-growth was present in a few spots, but there was no indication in any of the processes of malignancy. Tuberculosis could also be excluded. Here and there there was a small area of necrosis in the inflammatory tissue of the mucosa. Mr. Shattock therefore supposed that the whole disease was a chronic inflammation attended with swelling and some papillary up-growth, and due to some infective process of no particular specific kind.

On my observing that the description thus given did not account in my humble opinion for the clinical appearances and course of the disease, there having been a very distinct tumor projecting into the interior of the larynx with a mammillated surface, and slight ulceration on various parts, causing not only complete aphonia, but also pain shooting into the ears, Mr. Shattock suggested that the growth might have been at first a simple papilloma, which had run an unusual course; that without being malignant it had become the seat of an infective process; that this had in turn been followed by ulceration and swelling, which had exaggerated the clinical signs of tumor swelling, and led to the fixation of the parts.

I can, of course, not say that this suggestion might not correspond to the actual facts of the case, but seeing our complete want of knowledge of the existence of such pro-

cesses in the larynx as those sketched by him in this and in my previous case, I frankly confess that the explanation does not seem very satisfactory, and I shall be very much interested to hear whether any of those present are able, after inspection of the specimen here shown under the microscope, to shed some light on the subject.

Cases like the seven just mentioned of course reopen the vexed and perennial question of the value of the microscopic examination previous to radical operation of intralaryngeally-removed fragments of the suspected tumor. The elder generation will remember how fiercely that question was debated about twenty years ago on the occasion of the fatal illness of the late German Emperor. The views then expressed diametrically differed. In the opinion of some, clinical and naked-eye observation was like nothing compared with the evidence gained by an expert's microscopic examination. The other side looked almost with contempt upon the help of the microscope, and stated that it was only in exceptional cases that it was of any use.

When the sad case was over I endeavored to strike the balance between these conflicting views, and summarized the results of the collective experience of the then most prominent laryngologists of the world in the following conclusions¹⁰:

Microscopic investigation of intralaryngeally-removed fragments in cases of doubtful laryngeal neoplasms is a valuable but not infallible help to clinical diagnosis. It ought to be used in all cases in which it is possible. This is by no means always the case, inasmuch as in cases of submucous infiltrating cancer, intralaryngeal removal of fragments is impossible. If such a removal is available one ought never to forget: (1) That it is by no means certain that the examination may at all yield results characteristic of any definite form of tumor; (2) that, even when the examination yields apparently characteristic results, the possibility must be kept in view that we have to do with a mixed form of new growth. This is particularly important in cases in which the tumor is clinically suspicious and in which the microscopic appearance proves its benignancy. But the reverse is also possible, as shown by a case of Schmiegelow's. It will, therefore, be always desirable to transfer the microscopic examination, if it be possible, to an expert pathologist. The pathologist, however, can only give an opinion on the fragment submitted to him, and not

on the disease itself from which the patient suffers, except when he finds in this fragment *positive* characteristics of malignant new growth. Examination must not be limited to the investigation of one single section, but must be extended over the whole fragment, which accordingly has to be cut up into sections, unless already previously the diagnosis of malignancy can be established with certainty. If necessary, cautious intralaryngeal removal and microscopic investigation of fragments of suspected growth must be repeated several times, unless meanwhile clinical symptoms which are incompatible with our present knowledge of the symptomatology of benign growth establish with certainty the malignant character of the suspected growth. In such cases radical operation, if otherwise indicated, is *not* to be postponed until the diagnosis has been confirmed by the microscope.

This proposition, I think I may venture to say, met with general acceptance, and is, I believe, up to the present moment followed by most of those whose work brings them in contact with cancer of the larynx. But it has not been allowed to pass unchallenged. Some years ago Dr. John N. Mackenzie of Baltimore passionately opposed the probatory intralaryngeal removal of suspicious laryngeal growths for the purposes of microscopic examination¹¹. In his opinion such removal "subjects the patient at once to the dangers of autoinfection at the point of incision and to metastasis elsewhere; it stimulates the local growth of cancer, and the method is often inconclusive, sometimes misleading, and practically impossible."

I have fully answered, and I think refuted, Dr. Mackenzie's contentions some years ago¹², and would not have returned to the point now were it not for a surprising statement recently made in the excellent paper read by Dr. Chevalier Jackson¹³ at last year's meeting of the British Medical Association at Toronto. He says:

"Of twenty cases of malignant disease operated upon by me, negative preliminary microscopic reports of removed fragments were made in fourteen. That this was due not to the pathologist's error but to the inadequate specimens goes without saying. In each of the fourteen cases, operation, in the face of the microscopist's negative report, was advised, on the strength of the age of the patient and laryngoscopic appearances, coupled with failure of benefit from mercurial in-

unctions and 180 gr. daily of potassium iodide continued for three weeks."

I confess that this statement amazes me. To judge from my own experience Dr. Jackson has certainly been exceptionally unfortunate. If in my own practice from whatever cause I had found the microscopist's report at fault in anything like a proportion such as 14 out of 20 cases, I have no hesitation in stating that I should have long since joined Dr. John Mackenzie, and instead of recommending microscopic examination of intralaryngeally-removed fragments as a valuable, though by no means infallible method, have rejected it not only as inconclusive, but, what is much more important, as directly misleading. But my own experience has been widely different. Whilst again fully admitting that in a large percentage of the cases in question it is impossible, without unduly irritating the new growth, to intralaryngeally remove a piece for microscopic examination sufficiently large to enable the microscopist to arrive at a reliable conclusion; and whilst further admitting, as I have done in the above-quoted rule, that the piece removed may in a good many instances not show characteristic evidence of malignant disease, I can remember but one case within my own practice in which the microscopic examination yielded directly misleading results. This was the case of the late Mr. Montagu Williams, which I fully described in the *Clinical Society's Transactions*¹⁴, and in which the microscopic examination of the first fragment seemed to show that we had to deal with an innocent papilloma. But the mistake was corrected already five days afterwards, when examination of the second fragment gave definite evidence of the existence of epithelioma.

In many cases of my own, on the other hand, the microscopic examination of an intralaryngeally-removed piece of the new growth has not merely fully corroborated the clinical diagnosis, but has materially strengthened my hands in proposing immediate thorough operation. I therefore see no reason to withdraw from the attitude I recommended in 1888.

Two points, however, demand a moment's consideration at this juncture. In the first place, after two positive experiences of Dr. David Newman of Glasgow¹⁵, fears were expressed twenty-two years ago lest the probatory intralaryngeal removal of a piece of growth might hasten the local progress, and lead to infection of the cervical glands. Dr. John Mac-

kenzie has more recently reiterated this fear in lurid colors, and now I find that Dr. Chevalier Jackson also expresses his conviction that we subject our patient to some risk in the removal of a specimen "a week or more" before radical operation. In reply to this I venture to say that, with our perfected microscopic methods, no week or more need elapse before we receive the verdict of the microscopist; and whilst quite agreeing that the local growth of cancer may be stimulated by local interference, I cannot from my own experience bring myself to believe that the few days which must elapse between the intra-aryngeal removal and the report of the microscopist are likely to bring about any important deterioration of the local conditions, whilst the fear of local autoinfection of previously healthy parts in the larynx or of metastasis elsewhere is equally little justified by practical experience gained hitherto.

In saying this it is presumed, of course, first that the intra-laryngeal removal of a fragment is always to be carried out by expert hands, and that undue irritation of the growth and unintentional wounding of previously healthy parts are being avoided, and, further, that the rule laid down by Dr. Newman twenty years ago is strictly adhered to—namely, that the probatory intralaryngeal removal of a part of a suspected growth ought only to be undertaken after the patient has formally consented to immediate radical operation in the event of the microscope proving the malignancy of the tumor. Both these preliminary conditions are most essential.

The second point on which I wish to speak in connection with this question is one of much greater practical difficulty than the one just mentioned. Supposing that one had to deal with a suspicious growth, situated either near the anterior commissure and threatening to invade the other side of the larynx, or, worse still, situated near the arytenoid cartilage, in dangerous proximity to the posterior wall of the larynx, and supposing, further, that the microscopic evidence after examination of an intralaryngeally-removed fragment was of a negative character, what ought one to do? In accordance with my own rule quoted above, most operators nowadays would, I think, nevertheless proceed at once to radical operation, considering it the smaller evil of the two to perform a thyrotomy, where such was possibly not required, than to wait too long and thereby to expose their patients either to the

removal of both vocal cords, with subsequent complete loss of voice for the rest of their lives—namely, if the suspected growth in the anterior commissure should after all have turned out malignant, and should meanwhile have passed over to the as yet healthy other vocal cord; or, worse still, to total extirpation of the larynx—namely, if the growth, which ultimately proved to be malignant, had passed on to the posterior wall of the larynx.

Against this practice, however, it may be argued—not without some show of reason—that it was hardly fair to avail oneself of the testimony of the microscope if it spoke in favor of one's own contentions, and to brush it aside if it differed from them.

Moreover, if after all the growth should prove to be innocent when removed by thyrotomy and microscopic examination of its whole structure, the surgeon would undoubtedly have exposed himself to the accusation that he had not only performed an unnecessary operation, but that he had done so in the face of the evidence of the microscope.

Supposing, on the other hand, that he had removed such a growth on the strength of naked-eye examination only, and that subsequent microscopic examination had proved it to be benign, he would not only have laid himself open to the first part of the same reproach—namely, that he had performed an unnecessary operation; but he might be charged, and, indeed, very likely would be, with having omitted an important method of investigation before undertaking a more or less serious operation.

Supposing, finally, that, strong as his clinical apprehensions were, he had yielded to the negative evidence of the microscopic examination of an intralaryngeally-removed fragment, and had waited too long for confirmatory evidence, he certainly, when in the course of events the growth turned out to be malignant after all, and now too much advanced to be dealt with by simple thyrotomy, would have to reproach himself that he had not had the courage of his opinions, and had thereby exposed his patient to the risks of a much bigger mutilating operation, the final results of which are not nearly so satisfactory as those of thyrotomy.

You see, gentlemen, from my enumerating these contingencies, that whatever course you may follow there are drawbacks attached to each of them, and that whatever you may

do or may not do, you are apt to expose yourself, while acting with the best of intentions, to serious recriminations.

Nor must you believe that the contingencies I have just enumerated are merely theoretical, and not likely to come within range of practical politics. Twice within recent years have I myself experienced their unpleasant reality, and the irony of fate has willed it that fault should have been found with me for diametrically opposite reasons. In the first case, which I communicated so far as it was then in existence at the meeting of the British Medical Association at Swansea¹⁶. I was denounced because, firmly convinced as I was that the histologist's favorable report of a growth removed by thyrotomy was erroneous, I had in order to spare the patient harassing doubts given an evasive answer to his question anent the microscopic finding.* The second case was that of a subglottic, apparently malignant, rounded smooth tumefaction, from which it would have been impossible to remove intralaryngeally a fragment sufficiently large for microscopic examination without causing severe local irritation. After the performance of thyrotomy it was found that the tumefaction was due to an obscure infective inflammation. I, of course, informed the patient of this fact. The result has been, I am told, that I am now accused of having performed a perfectly unnecessary operation!

While there are thus great and undeniable difficulties, the course one ought to follow seems to me clear enough.

Seeing the fact that errors in diagnosis are occasionally made by those who have had the largest experience, and this sometimes even in cases in which there did not appear to be any particular diagnostic difficulties, I think it is our plain

*The further history of this case is as curious as was its beginning. The patient after leaving me put himself under the care of Dr. Greville MacDonald, who has kindly informed me that he removed with forceps large masses of the recurrent growth. This was pronounced by Mr. Shattock, who had declared the original growth an innocent papilloma, to be a papilloma in which a carcinomatous change was beginning. Mr. Watson Cheyne, however, to whom the microscopic preparations were also submitted, considered the diagnosis of carcinoma not proven. The patient then for a time refused to submit to any further treatment. Ultimately Mr. Cheyne had to perform tracheotomy in a great hurry, because the growth nearly filled the larynx and almost choked the patient. The tracheotomy was followed by another thyrotomy, also performed by Mr. Cheyne, last March. Neither macroscopically nor microscopically was any evidence of malignancy found. Since then no recurrence so far appears to have taken place.

duty not to omit the employment, whenever possible, of any recognized method that may be helpful in securing the diagnosis. Such a method certainly is the microscopic examination of intralaryngeally-removed fragments, provided that it is not approached with an exaggerated sense of its infallibility. Considering the fortuitous character of the intralaryngeal removal, and the fact that neoplasms are not by any means always uniform in their structure, the result of the examination may certainly be inconclusive, and sometimes even directly misleading. In addition, it must not be overlooked that the interpretation of the appearances seen in a microscopic slide is, after all, a matter of individual judgment, and liable in not a few cases to the same errors to which clinical examination is exposed. In proof of this I need only remind you that often enough the opinions of various microscopists to whom one and the same slide is submitted, diametrically differ from one another. The patient ought, therefore, to be in all cases given a brief and fully intelligible explanation of the state of matters, and ought to be plainly told that the evidence of the microscope was only conclusive if proof of a distinctly malignant histologic type, such as squamous carcinoma, was found; but that if the evidence were negative this did not by any means dispose of the clinical fears which were entertained in his case. It ought also, as already mentioned, to be made a *sine qua non* that in the event of the microscopic examination corroborating the clinical fears, the patient should consent to immediate radical operation.

Such a course in those cases in which the probatory removal of a fragment is possible at all without gravely irritating the growth—which is, I repeat, in a large proportion of cases coming under my observation not possible—will satisfy the surgeon's conscience, and will protect him against unjustified recriminations made afterwards with regard to his mode of procedure. In not a few instances, to conclude from my own experiences, the patient will, after such an explanation, declare himself satisfied with the clinical evidence, particularly if a second independent opinion should have been taken and should have agreed with that of the first adviser. Anyhow, it will not be possible for the operator to be charged with the omission of the employment of a valuable diagnostic method of which he should have availed himself.

Such is my present attitude in this truly important ques-

tion, and I shall look forward with great interest to the opinions thereon which will no doubt be expressed in the subsequent discussion.

With this hope I leave the question of diagnosis and come to that of therapeutics. During recent years attempts have been made to combat laryngeal cancer by other means than surgical, and such widely different methods as injections of a preparation of the *Bacillus neoformans* (Doyen), the x rays, and trypsin injections have been laid under contribution for that purpose.

The injections with Doyen's serum, which Dr. Scanes Spicer has recently employed in several cases of malignant disease of the throat, mouth, and larynx¹⁷, appear in that observer's opinion to favorably modify the symptoms and apparently retard the progress in certain instances, without, however, effecting a cure, while in other cases no benefit was received. Sheppergrell¹⁸ states that in a case of laryngeal cancer treated by himself with the x rays a cure was obtained. In this case, however, it is not stated that a histologic examination of the growth has been made, and it is therefore impossible to say whether the growth was really of a cancerous character. One isolated cure is claimed in a case treated with trypsin injections by Dr. Clarence Rice¹⁹, although the author is careful to state in the subtitle of his paper that the case thus treated was "supposed" to be carcinoma.

In the interest of our patients it seems but right to express a hope that the further study of the alleged influence of trypsin upon the cancerous process will be allowed to remain in the hands of the medical profession instead of such uncertain cases being sensationally claimed—as Clarence Rice's has been—as "cancer of the larynx cured by trypsin." We shall all most heartily welcome any method by which the scourge of cancer may be successfully combated otherwise than by operation, but the millennium has not yet come to pass, and there cannot be the slightest doubt that at the present moment our only justified hope of curing the disease in any given case consists in the growth being eradicated by surgical means at the time when it is still purely local.

Of the operations which come into question for that purpose I shall more particularly dwell upon thyrotomy and total extirpation of the larynx, while the intralaryngeal method, subhyoid pharyngotomy, and partial extirpation will on this occasion be dismissed with very few words.

With regard to the intralaryngeal method, instead of repeating the arguments which I have on many occasions brought forward against it, I prefer telling you what has quite recently been stated on this point by a man equally distinguished as a general surgeon and as a laryngologist, Professor Paul von Bruns of Tübingen. He says²⁰:

"The intralaryngeal operation is recommended by some laryngologists (Fraenkel, Jurasz, Bresgen, Krieg) as the least dangerous interference with regard to life and voice in suitable cases of small cancers situated in accessible positions. Baginsky quite recently goes so far as to state that the external operation is only to be employed in the majority of laryngeal cancers.' B. Fraenkel has collected from his own practice and that of others a number of cases in which after laryngoscopic operation the cure has lasted at least the triennium generally accepted for carcinomas. Thus, it is true, the possibility of cure by the intralaryngeal method has been proven, but this is an extremely rare exception, which demands the concurrence of numerous favorable circumstances, for the large number of unsuccessful attempts is of course nowhere registered. By such attempts, however, a more rapid growth of the neoplasm may be promoted, a favorable time for external operation missed, and its chances materially deteriorated. From this point of view, which is shared by well-known laryngologists, such as Schrötter, O. Chiari, Moure, and Semon, I consider the employment of the intralaryngeal method in laryngeal carcinoma as insufficient, and one to be rejected, because, as a rule, it only damages the patient. I have seen sad examples of this. Kocher point-blank declares that intralaryngeal attempts at operation in suspicious laryngeal tumors are 'faults of art.'"

With this opinion I thoroughly agree.

The next operation to be considered is thyrotomy, of which it may truly be said that not only men and books but also operations have their fates. At first employed in unsuitable, because much too far advanced, cases; then, as a natural consequence, rejected and absolutely condemned; then remaining in abeyance for a number of years; then resuscitated through the perspicuity and courage of Mr. Butlin; then quickly gaining the upper hand in this country, and justly considered as the standard operation for early cases of intrinsic laryngeal cancer, while still, with few exceptions, looked at askance by sur-

geons and specialists abroad; and only quite recently and slowly gaining its proper position on the European Continent and in the United States—such has been in briefest possible outline the history of thyrotomy during the last quarter of a century. Even now I regret to say that I learn from a paper read only last spring at the meeting of the South German laryngologists at Heidelberg that, “in order to obtain a lasting cure,” a number of German surgeons remove the whole larynx even in unilateral cancer of the larynx and reject thyrotomy for cancerous new growth as an “insufficient interference.”

It is an ungrateful and, indeed, impossible task to convince people who will not be convinced; and, with regard to such, one's only consolation is that truth will prevail over their theoretical objections. Those, however, who approach this, as other questions, without bias will, I venture to hope, be convinced of the efficiency and sufficiency of thyrotomy by the following facts derived from my own personal experiences:

From October 10th, 1878, until December 31st, 1906, I have seen in private practice 212 cases of malignant disease of the larynx. Of these, 136 were intrinsic and 76 extrinsic or mixed. No less than 177 occurred in men, and 35 only in women. Of the latter, again, in 12 cases only was the disease situated inside the larynx, while in 23 it was extrinsic, occupying in 18 cases the pharyngeal aspect of the cricoid cartilage.

I have already, in 1894, drawn attention to these startling proportions, which have not changed in my subsequent experiences; and I need not repeat what I said on that occasion, except that the question of the disparity between the sexes and of the localization of the disease in women certainly deserves serious consideration on the part of those engaged in the study of the etiology of cancer. Apart from the bare facts just mentioned, I regret that my own experience does not assist in elucidating these mysteries. Neither syphilis, nor abuse of alcohol or tobacco, nor hereditary taint, nor excessive voice use could be accused in the large majority of my male patients as having played a role in the production of the disease. It remains equally inexplicable why in my series the proportion of extrinsic and intrinsic cases should have been practically the reverse in the two sexes, there having been 124 of intrinsic and 53 of extrinsic in men, against 12 cases of intrinsic and 23 of extrinsic in women.

My experience since 1894 with regard to age again confirms

my statement made in that year, namely, that the thirty years of life between 40 and 70 furnish the overwhelming majority of all cases of malignant disease of the larynx coming under observation, but I have seen in the twelve years past since then more cases occurring in the decade between 60 and 70 than in that between 50 and 60. Three patients seen between 1894 and 1906 were 80 years of age; none were younger than 30.

While I have thus seen 136 cases of intrinsic laryngeal cancer, I have only performed thyrotomy—which is, in my opinion, the operation for this class of cases—in 33 cases of real or supposed malignant disease of the larynx. No conclusion must, however, be drawn from these numbers as to the proportion of cases of intrinsic laryngeal cancer suitable for thyrotomy. First of all, a large proportion of these cases were sent to me before thyrotomy had been reintroduced by Mr. Butlin; secondly, a very considerable number of my cases only came under observation in the course of consultation with other surgeons and specialists, who wished to have my opinion as to diagnosis and operation, and who, when these questions had been settled in favor of operative interference, performed the latter themselves. In the light of my present experience, I should certainly say that in *all* cases of cancer, still limited to the interior of the larynx, not too extensive, not too near the posterior wall, not yet infiltrating the laryngeal cartilages, thyrotomy ought to be performed unless there are urgent contraindications arising out of the general health of the patient. Advanced age is in itself by no means a contraindication if the patient is otherwise vigorous and free from serious organic complications. I have in nine cases performed thyrotomy in men between 60 and 70, and in three in men over 70 with excellent results, and my very last case is that of a gentleman, aged 75, who nine days after thyrotomy for epithelioma of the larynx left the home in the best of health.

On the other hand, general debility, chronic bronchitis, advanced Bright's disease, diabetes, and similar serious organic mischief, of course gravely affect the prognosis.

Out of my 34 thyrotomies—in one of them the operation had to be repeated almost immediately after the first operation—undertaken in 33 cases for what seemed to be certain or very probable malignant disease of the larynx, in 8 the diagnosis was shown either to have been at fault or remained doubtful. Twice the disease turned out to have been tuber-

culous. Twice the tumefaction was stated by Mr. Shattock to have been of the nature of an infective inflammation. In 2 cases the diagnosis remained doubtful between fibro-sarcoma and innocent growth. In one case, already referred to in this paper, it is, in my opinion, still quite an open question whether the disease is of an epitheliomatous or papillomatous character, and in one case the subsequent history showed that the nature of the tumor had been that of an innocent papilloma. Three out of these 34 ended fatally, giving a percentage of 8.8 fatal results.

In one of the three fatal cases—reported before 1904—death resulted from an aggravation of a pre-existing bronchial catarrh in a very old man six days after operation; in the second case, death eleven days after the operation was the result of secondary bleeding and subsequent exhaustion in a very feeble old man of 76; the third case, in which death resulted twenty-seven hours after the operation from edema of the lungs, has already been alluded to in a previous part of this paper. It is a particularly melancholy circumstance that out of these 3 deaths 2 should have occurred in cases in which, according to the subsequent microscopic examination, the disease was not of a malignant character, but of the nature of an infective inflammation, and this fact adds, I should think, further weight to the view that microscopic examination of an intralaryngeally-removed fragment should whenever possible precede radical operation.

Of the cases of undoubtedly, that is, microscopically verified, malignant diseases of the larynx, which were 25 altogether, 1, as just mentioned, died, and 24 recovered. In one of them the operation had evidently been incomplete. A second thyrotomy was performed at once, with more radical removal of the neighborhood round the recurrent growth, and the patient has since (more than two years ago) remained perfectly well. In 4 cases recurrence took place. In 1 of these the patient died from cancer of the liver five years after the operation, the larynx and the cervical glands remaining free. This leaves, therefore, a percentage of 3 to 24 of cases of genuine local recurrence. In the first case recurrence took place nine months after the operation, and the patient, having refused further surgical treatment, died eighteen months after the operation. In the second case the first recurrence took place four months after the operation, when hemilaryngectomy was performed.

A year afterwards this had to be followed by total extirpation of the larynx on account of metastasis in the cervical lymphatic glands, which were inseparably bound up with the larynx, the interior of which, however, this time had remained perfectly healthy. Death ensued from coma twenty-four hours after the operation, which was performed by Professor Gluck. The patient had been suffering from advanced chronic nephritis. In the third case recurrence took place eleven months after the operation, and hemilaryngectomy has been performed too recently to say anything about the final result.

Deducting, then, from these 24 cases one too recently operated upon to be of any value for statistical purposes concerning freedom from recurrence, and one in which, five years after the operation, the patient died from cancer of the liver, the larynx and cervical glands remaining free, we find that out of 22 cases of undoubted malignant disease of the larynx, a genuine local recurrence took place in 3 cases. This gives a percentage of 13.6 recurrences. If the case in which death from cancer of the liver took place five years after the operation be included amongst the recurrences, we find 4 recurrences in 23 cases, or 17.4 per cent recurrences.

With regard to the case just referred to, however, I wish to observe that, whether that occurrence ought to be looked upon as a genuine metastasis, or whether the same obscure agencies which caused the malignant disease in the first instance produced it again anew and independently of the first manifestation, must remain an open question in the absence of a *post-mortem* examination. The possibility just named is not so far-fetched as might be thought. A case has been reported by Gluck²¹ in which, after extirpation of a squamous-celled laryngeal carcinoma, a cylinder-celled carcinoma, from which the patient died, developed two and a half years afterwards in the transverse colon. In this case, at any rate, the idea of a genuine recurrence is excluded, and one cannot think of anything else but of a genuine fresh production of another form of malignant new growth.

The last category to be considered under this head, that is, the cases in which no recurrence took place, or in which, either after incomplete operation or after recurrence, lasting freedom was obtained after further operation, demand some special consideration before their ultimate result can be expressed in figures.

The determination, in cases of operation in any part of the body for cancer, of the exact period after the lapse of which the patient may be considered as "cured," is, of course, purely conventional. However late a date within the bounds of reason may be chosen, it will always be easy to point to some isolated cases recorded in literature in which recurrence, local or metastatic, took place after an even longer interval. All that can be said, therefore, is that when speaking of a "cure" in cases of operation for cancer, one means that the period has been passed within which, according to general experience, recurrence, if at all, usually takes place, and that the patient might now be reasonably expected to enjoy lasting freedom from the disease. In accordance with this ratiocination, by common consent the period of three years is now considered to cover the time of danger of recurrence, and statistics of operations for cancer are usually constructed upon this principle. Ten years ago, however, I pointed out that, owing to the peculiarities of the lymphatic supply of the larynx, intrinsic cancers of that part occupy an exceptionally favorable position with regard to the question of recurrence after radical operation, and that when one year has passed without recurrence, the patient may be justly regarded as having passed the critical period. At present, after ten years' further experience, I stoutly maintain the position then taken. It has been shown that in not a single one of the cases in which I performed thyrotomy recurrence took place after the lapse of the first year, and I shall therefore make that period the basis of the following calculations. I do so, not for the purpose of including a few more cases of cure in my tables, but because I know from practical experience how happy the patients are when they are told after the lapse of one year after the operation that they may now, humanly speaking, be considered out of danger of recurrence, and because I think it is right to give them that comfort. Subtracting, therefore, from my 25 cases of operation by thyrotomy for undoubted malignant disease of the larynx, 1 case in which death occurred from the operation, 3 cases in which local recurrence occurred within the first year after the operation, and 1 case too recently operated upon to be included in this list, but including on the other hand 1 of incomplete operation in which after the second thyrotomy a lasting cure was effected, we have 20 cases of lasting cure remaining, that is, exactly 80 per cent. If, however, the case

be further deducted in which five years after the operation the patient died from cancer of the liver, 19 out of 25 cases, that is, 76 per cent of lasting cures would be obtained. Truly an extremely pleasing result, which I think favorably compares with the results of radical operation for cancer in any part of the body.

The duration of the cure in each individual case from the date of the operation to December 31st, 1906, has been as follows:

- 1 case —over 15 years.
- 4 cases—between 10 and 15 years.
- 4 “ —between 5 and 10 years.
- 2 “ —over 4 years.
- 3 “ —over 3 years.
- 2 “ —over 2 years.
- 1 case —just 2 years.
- 1 “ — 1 year and 10 months.
- 1 patient died 5 years after operation from pulmonary embolism.*
- 1 patient died 4 years after operation from pneumonia.*

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The vocal results are equally satisfactory; voice surprisingly good in 11 cases, good or fair in 5, weak or reduced to a whisper in 4. In not a few instances both vocal cords had to be removed.

Finally, in this connection, I wish to mention as an additional advantage of thyrotomy that even in the cases in which either the operation has not been complete, or in which unfortunately genuine recurrence has taken place, the operation does not bring us to the end of our resources, but that on the contrary, by a repetition of the operation, or by hemilaryngectomy, or by total extirpation of the larynx, a lasting cure may still be obtained, where the minor operation has failed.

With regard to the technic of the operation, I still adhere entirely to that described by me in 1894 in the *Lancet*, and only wish to recommend anew on this occasion the excellent shears for splitting the thyroid cartilage invented by my friend, Mr. Waggett. Various modifications of the technic, however, have been suggested, and Professor Paul von Bruns, who now, in accordance with the view generally held in this country, con-

*In both these cases recurrence was absolutely excluded.

siders thyrotomy as the "normal" operation for the early stages of laryngeal cancer, describes the following as his own method²².

"Instead of general narcosis, half an hour to an hour before the operation an injection of scopolamin and morphin is given, and a solution of novo-cocaine is injected into the line in which afterwards the external excision is to be made, while after the larynx has been opened, the mucous membrane is painted with a solution of novo-cocaine and adrenalin, in order to abolish reflex cough and deglutitory movements, and to limit bleeding from the mucous membrane. If no graver hemorrhage is to be feared, previous tracheotomy and introduction of a cannula is avoided. With Kocher, I prefer the oblique position of the body, with the head hanging down, in order to more securely prevent the aspiration of blood; this position also protects against the invasion of the pharyngeal phlegm—which is often secreted in large quantities—into the larynx, and which has otherwise to be prevented by plugging of the lower parts of the pharynx. The division of the cartilages extends throughout the larynx into the trachea, in order to give sufficient space. When the cartilaginous halves have been drawn asunder, an incision—if necessary under artificial illumination by means of a small electric lamp—is made all round the tumor down to the perichondrium and close to the cartilage. The bared surfaces are, if necessary, burnt with the galvanocautery, and iodoform is rubbed into them. The introduction of an iodoform gauze tampon is omitted. Finally the halves of the thyroid cartilage are brought together, and the upper part of the external wound is closed, while the lower part in the region of the trachea remains open, and is only loosely plugged. No cannula is introduced."

This method differs in various essential points from that in general use in this country, particularly in the avoidance of general narcosis and of the use of Hahn's or some other form of tampon cannula. Seeing that Professor von Bruns speaks from practical experience and has obtained good results by the method he describes, it would seem captious to object to it from a theoretical point of view. I fully see the advantages of placing the patient in an oblique position with the head hanging down, and thereby avoiding the introduction of a cannula, even during the operation, and shall give this method a trial.

I cannot help doubting, however, the advisability of employing adrenalin in painting the mucous membrane after splitting the larynx. Cocain fully suffices for that purpose, and the employment of adrenalin, as I have personally experienced in one case, increases the risk of secondary parenchymatous hemorrhage. Altogether, I must say that the results obtained by the old method certainly are satisfactory enough not to necessitate modifications, although I by no means wish to imply that the technic generally followed in this country must necessarily be final.

I have only to add one word about the question of rectal etherization, which I see from the discussion following Dr. Chevalier Jackson's paper has again been proposed as a convenient mode of administration of the anesthetic in cases of thyrotomy, as it dispensed with the anesthetist's encroaching upon the narrow field of operation. That it does so is no doubt true, but it seems to have been forgotten that I fully described in my paper in the *Lancet* in 1894 a very lamentable case of death after hemilaryngectomy, in which the fatal issue was beyond a shadow of doubt due to ether poisoning after rectal administration of that anesthetic. Not only the intestines and the stomach, but the bronchi, large and small, were intensely congested, and showed numerous large and small ecchymoses and free hemorrhages on their surfaces. For further description of the details I must refer to that paper, but I wish to say that nothing would induce me, after this extremely sad experience of my own, to give that method a fresh trial.

Of the next operation on our list—namely, hemilaryngectomy, or partial extirpation—I have to say but a few words. It is obvious that this operation will become rarer in proportion to the diagnosis of intrinsic cancer being more generally made at an early stage of the disease. In fact, it is likely that ultimately it will be limited to those cases of intrinsic cancer which come under observation only at a period when the disease has already invaded the cartilaginous framework, and to a few exceptionally favorable cases of extrinsic cancer. Quite in conformity with these general considerations I have only had occasion to perform the operation in five cases. In one of them—just referred to—death occurred from ether poisoning. The other four patients recovered. In one of them, in whom thyrotomy had been performed previously, the operation

is of quite recent date. The results of the three remaining ones were not satisfactory; in one it is doubtful whether recurrence took place, although this is not probable. The patient died suddenly ten months after the operation from the bursting of an abscess in front of the trachea. In the second case recurrence took place in the cervical glands, the larynx remaining free, and death ensued fifteen months after the operation, the patient refusing further operative interference. The growth had been pronounced by Mr. Shattock to have been highly malignant, and the prognosis was bad from the first. At the time of the operation the thyroid cartilage was already invaded. The cervical glands were apparently not involved at the time of the operation. In the last case—already referred to—in which the patient was at first operated by thyrotomy, and afterwards by hemilaryngectomy, recurrence took place, about ten months after the last operation, in the cervical glands. Professor Gluck removed not only the cervical glands, but the larynx *in toto*, as its outside was inseparably connected with the affected glands. The patient never regained consciousness, and died about twenty hours after the operation had been completed.

My results of hemilaryngectomy are, therefore, far from satisfactory, and, as the outcome of my experience, I should certainly recommend removal of the corresponding cervical lymphatic glands, even if they are apparently not invaded, in cases in which infiltration of the thyroid cartilage renders hemilaryngectomy necessary. I have nothing to add to my previous description of the technic of the operation, except that in some cases it may be possible to safely leave a zone of the affected cartilage, either in its upper or in its lower region, behind. This materially assists in the prevention of stenosis.

With regard to subhyoid pharyngotomy, I have equally little to add to my previous description. I see from Professor Paul von Bruns's latest statistics of all subhyoid pharyngotomies performed for laryngeal cancer since 1890, that in 16 per cent only a cure lasting from one to three or more years had been obtained, that in 20 per cent recurrence took place, and that the mortality of the operation was no less than 40 per cent. Quite apart from the fact that it can be employed only in a very limited number of cases, namely, in those in which the disease is situated near the upper aperture of the larynx, the danger of the operation is so great as to give little encourage-

ment for its adoption, particularly in view of the fact that equally good access to the growth can be obtained by laryngotomy.

I myself have performed subhyoid pharyngotomy but once for malignant disease of the larynx²³, and have met with the same disappointing experiences as others have done, namely, that the patient died on the fourth day after the operation, probably from sepsis.

The last part of my task, namely, the discussion of total laryngectomy, I approach, I do not mind confessing, with some trepidation. Experience has taught me²⁴ that thoroughgoing laryngectomists, with some exceptions, of which Professor Gluck is the most praiseworthy example, are apt to regard everyone who does not go to the entire length of their own convictions, as an enemy, and to treat him accordingly. Nevertheless, this shall not deter me from reiterating on this occasion the views, which I have consistently upheld since first total laryngectomy was discussed in public, and which may briefly be defined as being about equidistant from prejudiced antagonism to, and from injudicious adulation of, this operation. Like every sane person I unconditionally admit the legitimacy of any operation which saves, or even only appreciably prolongs a fraction, however small, of lives otherwise irretrievably lost, and I thus unreservedly recognize the justifiability of total laryngectomy. I gladly register that the formerly terrible mortality of the operation has through the progress of the technic been very much reduced of late years, and, finally, I do not doubt that a few of the patients who have survived the operation for any length of time have been and are quite content with their lot. But when thus much has been stated, I honestly believe that all has been said that could possibly be adduced in favor of total laryngectomy, and I cannot bring myself to regard the question of the kind of life the patients have to lead after a successful operation, and the question of the frequency of recurrences, as so secondary and comparatively unimportant as is certainly being done by the more militant faction of the enthusiastic advocates of the operation.

Total laryngectomy is beyond the shadow of a doubt one of the most mutilating operations in surgery. It does away with speech in its ordinary sense, for of the many ingenious phonatory contrivances which have been invented and recom-

mended, I have never seen a patient avail himself for any length of time. He rather puts up with the pharyngeal whisper, which in some cases is audible at a distance, or communicates with the outside world in writing. In not a few cases to this loss of speech is added permanent difficulty in swallowing, which compels the patient to take his meals by himself or even to be fed artificially. All this more or less shuts out the patient from the company of his fellow men, partly from instincts of his own, partly from being driven to observe that he is an object of pity mixed with horror to others. He therefore, usually shuns society and becomes a recluse. I do not wish to be accused of exaggeration, and I therefore emphatically repeat that no doubt some patients may lead a more amenable existence. Personally, however, while often enough meeting in society and in public places persons who have been successfully thyrotomized by others as well as by myself, I have never seen a patient whose larynx has been removed, elsewhere than in the meeting room of a Society, in which his case was demonstrated as a success; or in my own consulting room, when a recurrence has taken place. This, I believe, is also the general experience of others, and, in view of this fact alone, the lightheartedness with which by some total laryngectomy is recommended and practiced when less serious interference would have fully sufficed, appears to me not only regrettable, but directly reprehensible.

In addition, there is that extremely serious question of recurrence after total laryngectomy, of which I am fully convinced we have not yet sufficient modern data to build a reliable opinion upon, and which yet is so extremely important when the question as to whether total laryngectomy ought to be undertaken or not in a given case comes to be considered.

The only modern reliable statistics, so far as I know, of any single operator who has had considerable experience of his own are those of Dr. Chevalier Jackson. He states²⁵ that out of 8 total laryngectomies performed by him 3 were hemilaryngectomies followed by recurrence and total removal. One of the patients lived seven years after, when he died from cancer of the stomach; another lived three years without recurrence, dying of cerebral hemorrhage; and the third died eight months after from alcoholism. Of the remaining 5, 3 had recurrence within the year, 1 apparent cure was lost to observation after a year, and 1 is too recent to record.

Out of the 3 prompt recurrences there was 1 metastasis in the lungs, liver and pancreas. Thus out of 8 laryngectomies no absolute ultimate cures could be claimed in the author's own opinion, although 3 were apparently cured at the end of one year. I entirely agree with Dr. Chevalier Jackson when further on he states, with regard to the case in which seven years after removal of the larynx cancer of the stomach occurred, that such a recurrence indicates a vulnerable soil more than repullulation of the primary process.

I have for the purposes of this paper applied to Professor Gluck, and requested him to give me if he could a summary of all his experiences with regard to total laryngectomy. In reply he regrets being unable to comply with my wish, on account of the difficulty of obtaining replies from the very large number of patients from a distance upon whom he has operated. He at the same time states that, while formerly his material had mostly consisted of cases in which the disease was limited to the larynx, more recently, in consequence of the progress of technic, the cases in which the pharynx, esophagus, and tongue were affected together with the larynx had considerably increased, the operation being thereby, of course, made more serious still. All the same, remarkable results had been obtained, and he could assure me that quite a number of patients in whom not only total extirpation of the larynx but also resection of the pharynx had been performed, had survived the operation for many years in a good state of health. He also promises to try and ascertain for a future occasion the total results of his experiences.

Professor Paul von Bruns apportions, in a statistic of all total laryngectomies performed since 1890, the proportion as follows:

Cure lasting more than three years.....	10	per cent
Cure lasting one to three years.....	16.6	per cent
Cure lasting less than one year.....	28.9	per cent
Recurrence	24.5	per cent
Death owing to operation.....	19	per cent

Personally, I can only say that what I have seen of total extirpation of the larynx has been anything but encouraging. I have never performed the operation myself, but have confided those few of my patients who, after full exposition of the situation, decided upon submitting to the operation to

most experienced hands. One of my patients died from the operation itself, as already stated; none of the other three has survived the first year after operation. Not wishing to make sensational statements, I will only say that in all these cases the life the patients had to lead from the operation until their release by death was extremely sad. Indeed, whenever I have seen these patients a few months after the operation, with recurrence fully established, the question has forced itself upon me with ever increasing emphasis whether such a result was worth the mental anxiety, the physical suffering, the heavy expense, and the blighted hopes necessarily connected with the course that had been taken. All the same, I have kept before my mind that probably my personal experience has not only been small but exceptionally unfortunate, and that after all there remained the one stern fact that those patients' lives would have anyhow been irretrievably lost if no operation had been performed at all. I have, therefore, never dissuaded a patient, whose case seemed to offer a reasonable chance, from undergoing the operation, but have considered it my duty to lay an impartial statement of the alternatives of letting matters take their course and of having total laryngectomy performed before the patient, and in no way to influence his decision. Such a line of action appears to me the more required in view of the unfortunate fact that in a certain proportion of cases so-called cured patients have committed suicide.

Unfortunately, until a specific has been discovered which cures malignant disease without having recourse to the knife, total laryngectomy will remain a cruel necessity in cases of extrinsic cancer of the larynx. From my own statistics above quoted, however, it will have been seen that fortunately the extrinsic variety is by far the rarer of the two by which the larynx may be attacked; and I feel sure that I shall have the sense of this meeting with me when, in conclusion, I express an ardent hope that every practitioner should endeavor to diagnose the intrinsic variety at so early a time that thyrotomy will suffice, not only to save the patient, but also to help him to an amenable existence afterwards. Fortunately I can say that, to conclude from my own experiences, this desirable improvement in early diagnosis has made material progress during the last few years. Still much remains to be done in this respect, and I cannot better end my introductory remarks

than by the expression of a fervent hope that this discussion may give a fresh impetus to early diagnosis and immediate thorough removal of the disease by thyrotomy in cases of intrinsic cancer of the larynx.

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XIV.

THE IMPORTANCE OF CORRECTING PATHOLOGIC CONDITIONS OF THE NOSE AND THROAT IN PATIENTS WHO HAVE INCIPIENT TUBERCULOSIS.

BY WILLIS S. ANDERSON, M. D.

DETROIT, MICH.

Pulmonary tuberculosis is a disease which attacks persons of lowered vitality. The lowered vitality results from improper or insufficient food, unsanitary surroundings, intemperance or other vicious personal habits, overwork, mental worry, and disease. Tuberculosis does not attack the strong and vigorous. The tubercle bacillus finds lodgment in tissues that are below par.

The problem to be met in the treatment of this disease is to increase the resistance of our patients. In the absence of any specific agent for this purpose, we rely mainly upon hygienic, dietetic and climatic measures.

The value of fresh air and out of door life is now generally recognized. It is customary to advise patients to live out of doors even in the coldest weather, but few physicians think of examining the nostrils of their patients to see whether it is possible for them to obtain the benefits of fresh air by normal breathing.

A carefully regulated diet may be prescribed with digestants and stomachics to encourage the stomach to perform its function; but if the tonsils are hypertrophied, with septic accumulations in their crypts, or if there is muco-pus in the nose or sinuses, we know that digestion will be impaired. This impaired digestion may arise from the absorption of septic material from the nose and throat, or from the swallowing of the secretions.

As an aid in the treatment of tuberculosis, we should increase the bodily resistance of our patients by restoring to as near normal as possible any defective organ. The failure to appreciate the importance of this rule has lessened the chances of recovery of many tuberculous persons.

If organic defects are found after a thorough examination of a patient, judgment is required to determine what bearing they may have on the pulmonary condition and general nutrition. Organs remote from the respiratory tract, though pathologic, may have little, or no effect, on the local condition. The correction of some lesions might necessitate more risk, or a longer period of close confinement, than would be warranted in certain cases. There is such a close relation between the upper respiratory tract and the lungs, that any abnormal condition of the nose and throat should receive careful attention.

We shall study these abnormal conditions under the following heads:

Pathologic Conditions of the Nose, Nasopharynx and Pharynx.—The lesions in the nose may be grouped into two classes: First, obstruction to free nasal breathing; and second, any condition which gives rise to accumulations of mucus, or muco-pus in the nose or sinuses.

The study of the physiology of nasal breathing in the lower animals gives us many hints as to its importance in man. We know that animals are very dependent upon nasal breathing, which, if interfered with, leads to serious disease or even death. Man has greater powers of adaption, therefore nasal obstruction does not produce the serious immediate effects that are noticed in the lower animals. There is difference of opinion as to what constitutes free nasal breathing. Air may be drawn with effort through nostrils that are not free for ordinary quiet respiration. A cursory examination of the nose may show a fairly free passage, but a more careful examination may reveal narrowness at one or more points. We must remember that the breathing capacity of the nose is measured by its narrowest point. The current of air passes in a curved direction, upward and backward to enter the nasopharynx. A comparatively small obstruction in the upper portion of the nose or nasopharynx, will interfere with the current of air in its passage to the lungs. While such an obstruction does not prevent the forcible drawing of air through the nose, it does interfere with normal, quiet breathing. Many patients claim to have free nasal breathing, when in reality they breathe all the time partially through the mouth.

If we notice in public places how persons breathe, a considerable number will be observed with the lips more or less parted; this indicates that a certain amount of respired air is

entering through the mouth. The majority of these individuals do not realize that they are mouth breathers. I have asked many patients to try the experiment while walking along the street, of keeping their lips closed and noticing whether they could breath comfortably through the nose. In many instances after walking a block, or less, they will open their mouths a little to obtain more air. After taking several breaths they can close their mouths again for a few moments. While these patients can breathe through their nose, the space is not sufficiently free to give them all the air necessary. This partial mouth breathing is not normal, and is an important factor in the etiology of the so-called catarrh of the laity. These patients are subject to colds which may be localized in the nose and throat, or involve the lower respiratory tract as well. They are frequently hoarse and have a dry, irritable throat, which is more marked in the morning.

In examining the lungs of persons who have nasal obstruction, I have noticed that there is a diminution of breathing, more marked at the apices, or what is sometimes spoken of as "lazy lungs." It is not always easy for the physician to decide whether a given individual has proper breathing space or not. Several examinations may be necessary before this point can be determined. The writer suggests a certain routine in order to determine this point.

While getting the history, and without calling the attention of the patient to his breathing, notice carefully if the lips are a little separated and if some air is entering through the mouth. Ascertain if the patient notices an alternate obstruction of the nose at night, or in damp, changeable weather; if in the morning the throat is dry from mouth breathing; and if the voice lacks resonance, or has a nasal quality. An examination of the nose should then be made to estimate the amount of breathing space. After this preliminary examination the soft parts should be shrunk by the use of cocain and a suprarenal preparation. While shrunk, notice whether there are any points that are especially narrow. By examining the turbinals before and after they are contracted, an estimate can be made as to how much of the size is due to intumescence and how much is due to hyperplasia, or to enlargement of the turbinated bones.

The conditions to be looked for especially are polypi, or other tumors; narrowing due to deviation of the septum; hyper-

trophy of the anterior or posterior ends of the inferior turbinals; and hypertrophy of the middle turbinals. The middle turbinate is often the offending member, and its importance as an etiologic factor in the production of nasal obstruction is frequently overlooked. It often causes intumescence of the inferior turbinal by interference with the circulation. In such cases it is useless to cauterize the inferior turbinal without removing the underlying cause of the intumescence. After all, it is the care and judgment of the examining physician which must finally determine the relative amount of nasal breathing.

An excessive amount of mucus, or muco-pus, may accompany nasal obstruction, and when present usually indicates involvement of **one or more** of the accessory sinuses. Nasal obstruction and improper drainage are the usual causes of chronic sinus involvement. Sinus disease is a menace to the health and comfort of a patient, and in itself lowers bodily resistance.

The nasopharynx is less frequently obstructed in adults than the nose, but there remains some hypertrophy of the tissues of the vault, or a granular condition, in those cases which had lymphoid hypertrophies in childhood. This causes an accumulation of thick, tenacious mucus, which is aggravated if there is nasal obstruction. Chronic follicular pharyngitis is frequently found in tuberculous patients. It causes an irritation, with a constant desire to clear the throat, and often a dry, irritable cough.

Diseased tonsils are a source of great danger to tubercular persons. There is now abundant clinical and experimental evidence that various infections enter the body through the tonsils. Infection has been traced in animals from the tonsils, through the lymphatics and cervical glands, to the bronchial and mediastinal glands. A submerged tonsil, with diseased crypts, is capable of doing as much, or more harm, than a large, hypertrophied tonsil. Tubercular tonsils are not rare, and tubercular cervical glands are very common.

We are indebted to Dr. George B. Wood, of Philadelphia, for many facts in reference to the lymphatic drainage of the faucial tonsil, and the infection of the tonsil by tuberculosis. He uses the term, "tonsillar lymph. gland," to describe a lymph node, which is enlarged during tonsillar infection. It is situated external and slightly anterior to the internal jugular vein, and is imbedded in loose areolar tissue, containing more

or less fat.

Dr. Frederick A. Packard, in his Wesley M. Carpenter lecture on "Infection through the Tonsils," 1900, brought together many data, which emphasized the important relation between tonsillar and rheumatic affections. Many other observers have shown that it is just as important to appreciate the role that the tonsils play in the etiology of tuberculosis. Besides the danger of direct tubercular infection we have septic absorption from the diseased tonsillar crypts. This slow absorption often causes a slight elevation of temperature, general malaise and lowered resistance. Hypertrophied tonsils may interfere with free breathing or deglutition, and the exudate which accumulates in the crypts impairs digestion and gives a foul odor to the breath. Hypertrophy of the lingual tonsils is frequently found. The principal symptoms noticed are a dry, irritable cough, constant desire to clear the throat, and congestion of the larynx.

Tubercular laryngitis complicates about one-third of the cases of pulmonary tuberculosis. A laryngitis is usually a forerunner of this condition, and imperfect nasal breathing is an important factor in the production of a chronic catarrhal laryngitis. Even where the larynx is not tubercular we commonly have a congestion and a hypersensitive condition, which in itself gives rise to an irritable cough and huskiness of the voice.

The above conditions are easily recognized by those familiar with lesions of the nose and throat, but they are not often considered in their relation to the early stage of tuberculosis. A patient with incipient tuberculosis is particularly susceptible to atmospheric changes, because of the lowered resistance. They shudder at the thought of remaining out of doors during the winter season. If they do not breathe freely through the nose, the cold, dry air is drawn into the lungs through the mouth. This causes irritation and congestion of the mucous membrane, and is a positive handicap in a patient's struggle for life and health.

We ought to realize that a case of incipient tuberculosis is not properly managed unless nasal obstructions are removed, diseased tonsils carefully dissected out, and other lesions of the nose and throat corrected as far as possible. The methods used in the treatment of these conditions are familiar to all and need not be considered in detail, although a

few general points will be considered.

Fortunately local anesthesia is sufficient in nearly every case. If for any reason a general anesthetic is to be used, the added danger which comes from the anesthetic itself should be considered. The danger from cocain poisoning is so remote, if the drug is carefully used, that we can exclude it from our consideration. There is very little shock following operations upon the nose. If both nostrils are involved, the worse side can be attended to first, and a little time allowed for the patient to recuperate before the second side is corrected.

In suppurative sinusitis the cavities should be drained and washed out. The nasal route should be chosen. Several points ought to be considered before advising a serious sinus operation upon a tuberculous patient; first, does the sinus disease in itself threaten life; second, the probable amount of shock to a person already below par; third, will the after-treatment be long and tedious; fourth, can the patient's symptoms be relieved by washing out of the sinus regularly, without recourse to operation? If the above points are considered very few radical sinus operations will be justified upon a tuberculous patient.

Hypertrophied lingual tonsils should be cauterized with trichloracetic acid, the galvano-cautery, or removed with a lingual tonsillotome according to the severity of the condition. Hypertrophy of the follicles of the posterior wall of the pharynx should be cauterized by touching the elevations with the point of the galvano-cautery, or in mild cases with trichloracetic acid.

In the treatment of the tuberculous we ought to consider nutrition as the ability not only to digest and to assimilate food, but also to inspire normally a sufficient amount of fresh air to meet the demands of the body. As success or failure in the treatment depends upon nutrition, attention should be directed to the upper air tract to lessen air hunger. That air hunger does exist from nasal obstruction is proven by the effect upon the nutrition of children who have adenoids, by the impaired health in adults when the nasal respiration is below normal, and experimentally in animals where one or both nostrils have been closed.

Some of the symptoms noted in the more severe examples of obstruction may be ascribed to pressure, and the interference with the circulation in the brain; this is accounted for

by the free anastomosis between the vessels of the nose and the meninges. If this condition exists it is all the more reason why the local pressure should be removed. There is probably no difference of opinion as to the importance of the severer type of nasal obstruction, but the milder forms may be considered by some as unimportant. I feel that this is a mistake and that even the milder forms should be given careful attention.

I might cite cases to illustrate the value of the principles outlined in the above paper, but the reports would not be conclusive, as the correction of the lesions of the nose and throat has been supplemented in every case by careful hygienic, dietetic and medicinal treatment. I feel convinced from my own experience that the correction of abnormal conditions of the nose and throat adds materially to the chances of cure in tuberculous patients.

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XV.

COMPLETE CONGENITAL OCCLUSION OF THE RIGHT POSTERIOR NARIS.

BY L. D. BROSE, M. D., PH. D.

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In a practice extending over twenty-five years I have met with but a single case of this nature, while Moritz Schmidt¹ states in his own practice he has never met with a case and had but one opportunity of seeing one, and that in the practice of a former assistant. During the past summer, while visiting the clinic of Prof. Killian, in Freiburg, his first assistant, Dr. von Eicken, told me of a case in their practice, occurring in a child less than three years of age, where both choanæ were wholly occluded, but thus far the parents had not consented to having an operation performed for its correction. In all, however, some fifty cases have been placed on record, but new cases are sufficiently interesting to be deserving of publication.

My patient, T. M., aged twenty-two years, and a resident of Oakland City, Ind., was sent to me January 29th, 1906, by Dr. Thomas M. Brown, because of a discharge of pus from the right nostril, with inability to breathe through this side of the nose. About three years ago he states he had the right upper first molar tooth extracted because of ulceration, and distinctly recalls that the discharge of pus from the right nostril has existed ever since. He has no recollection of ever having breathed through the right side of his nose. No other member of his family so far as he is aware has been similarly afflicted. The hearing is perfect in both ears and the general health has always been good. Syphilis is denied.

Anterior rhinoscopic examination showed a vertical ridge partially obstructing in front the lumen of the right nasal passage, with the presence of a yellowish-white purulent discharge, which we established as originating in the right maxillary antrum. A probe passed into the depths of the right nasal passage, was arrested at the posterior naris by a hard,

1. Die Krankheiten der oberen Luftwegen, 1894.

osseous feeling partition through which we were unable to find an opening. Closure of the left nostril necessitated breathing through the mouth. Posterior rhinoscopic examination disclosed a solid whitish partition, with a small central depression extending from the right palate bone across the nostril and uniting so intimately with the posterior portion of the bony septum that the line of articulation could not be detected. The retropharynx, Eustachian orifices and vault of the palate presented nothing abnormal. Fluids injected into the left nostril entered the retropharynx, while a similar injection into the right nostril was again returned without a drop entering the throat.

March 17th, 1906, under chloroform anesthesia, the following operative interference was undertaken at St. Mary's Hospital. The mouth was held open with a gag and then the index finger of the left hand inserted into the retropharynx to serve as a shield. A trochar was next passed into the right nostril and an effort made to perforate the obstruction near its center. Finding the resistance, however, at this point very great, search was made for a more yielding spot, and it was found above at the inner side near the base of the vomer. The opening made by the trochar was enlarged downward and outward with saw and chisel until a good sized rubber tube could easily be inserted. The hemorrhage was slight and the after-treatment consisted in the daily removal of the tube and cleansing of the nostril with a mild alkaline irrigant. Patient made an uninterrupted recovery and returned home wearing a piece of a number seventeen catheter, American scale, which at the expiration of six weeks he was to discard.

February 5th, 1907, he wrote me that he has long since left the tube out and is now able to breathe freely through both nostrils. The discharge of pus, however, from the right maxillary antrum still continues and he intends returning soon to have this corrected. According to Schroetter² the bony obstruction springs from the vertical plate of the palate bone, and so far as I was able to determine by posterior rhinoscopic examination and palpation in my patient, I am inclined to corroborate this statement. Hopman³, however, thinks

2. L. Schroetter. Angeborenen knoechernen Verschluss der Choanen. *Monatsschrift f. Ohrenheilkunde*, etc., No. 4, 1885.

3. Hopmann. Ueber congenitale Verengungen und Verschluss der Choanen. *Archives f. klin. chir.*, xxxvii, 2.

that originally there exists a high degree of stenosis of the choanal borders and this with deviation of the vomer and approximation of the internal pterygoid process of the sphenoid eventuates in total occlusion of the nares.

XVI.

INCORRECT NOMENCLATURE IN OUR LITERATURE.*

A HISTORICAL, CRITICAL DISCUSSION.

BY PROF. DR. H. SCHWARTZE.

HALLE A. S.

In our otologic literature, not only the German but also the foreign, there have been in use for about two decades certain incorrect terms for operations, forms of diseases, and therapeutic aids. It is of interest to science, whose goal is always truth, to remove such incorrect designations. They cause mistakes in the mind of the coming generation, the more so as they are reproduced in some of the latest text-books for beginners in otology, and are thereby impressed upon wider circles of thought and more dispersed in otologic use.

I will confine my critical and historical discussion in this place to three incorrect terms: "Radical operation," "Bezold's mastoiditis," and "Hartmann's tympanic tube."

I.

"RADICAL OPERATION."

I do not remember who was the first to introduce this name into otologic literature for "the radical opening of the middle ear." It is well known, however, that I have fought for years against the retention of this entirely unsuitable expression. Independent of the fact that it is not exactly defined, and its varying definition must cause confusion, we should give up this term because the hope of obtaining by it a complete and lasting cure of the chronic suppuration is not always fulfilled, nor can it be. Through this proud name, the inexperienced physician and the patient obtain hopes that not rarely prove in vain. At least, both physician and patient expect our "radical operation" will be a radical cure of the suppuration. This, however, is not an invariable result, as experience has sufficiently taught us. Even

*Translated from the Archiv f. Ohrenheilk, Vol. LXX, Nos. 1 and 2, by Clarence Loeb, M. D.

if the wound of the patient discharged as "cured" is dry, and shows no suspicious places with dry crusts, but has a faultless appearance, and everywhere is covered with the desired reflecting, thin epidermis, still relapses can occur which can cause subsequent lethal intracranial complications in spite of the apparently completely successful "radical operation."

So we must designate as an illusion the assurance frequently given that the patient will be freed by the "radical operation" from the danger of fatal termination of his aural disease, even when complete cure of the suppuration is not obtained by the operation.

We could speak of a true radical operation for the worst cases of caries, cholesteatoma and malignant tumors of the temporal bone, only if the disease focus could be thoroughly eradicated, and this would be possible only if a method could be found of resecting the whole temporal bone. Whether this will happen lies in the lap of the future. But even if this were possible, there still remains in these very severe cases the not-to-be despised factor in the radical result, that the neighboring bones of the cranium may be also affected, as frequently happens in malignant tumors.

For the present, therefore, we must be conservative with the *Freilegung der Mittelohrräume*" (operative laying bare of the term, "radical," and I propose the expression "operative middle ear), or shorter and as comprehensive, "Totalaufmeisselung," (complete exenteration) in contrast with a partial exenteration, i. e., opening of the mastoid and laying bare of the antrum mastoideum. The term used by me for so long, complete exenteration, has been accepted by other teachers of otology. A distinct advantage of this term over "radical operation" consists, in addition to the reasons mentioned above, in the fact that it does not limit the operation to the middle ear, but permits a subsequent opening of the labyrinth, when it contains pus as shown by a fistula leading to it or by partial destruction of the labyrinthine wall of the middle ear.

II.

"BEZOLD'S ABSCESS."

In my text-book of the year 1903¹; I stated that the form of mastoiditis which leads to a fistulous perforation of the tip or the inner wall of the process was known and described in medical literature long before Bezold, and had

even been pictured. In my "Pathologischen Anatomie des Ohres," 1878, p. 112, I reproduced the drawing of such a case, according to Kuh, which came from the year 1847. Prof. Julius Böke (Budapest) in 1873², before the Deutschen Naturforscherversammlung in Leipzig, demonstrated several temporal bones with such a localization of the carious perforation, where a gravity abscess towards the neck had followed. In my first discussion of 100 mastoid operations I reported in the Archiv f. Ohrenheilk, three cases of this kind, with complete histories. Nevertheless, in spite of the references to the frequent occurrence of this localization of the perforation of the bone in empyema and central caries of the mastoid, the name of Prof. Bezold has been joined to it, and it is called "Bezold's abscess." In his paper of 1881³ he erroneously thought he had discovered a new path for the extension of the purulent inflammation from the middle ear to the vicinity. However, he referred only to a fact known for a decade before that time. Even the symptomatology of the disease, more exactly described by him, was known (hard infiltration beneath the tip of the processus mastoideus; deep, extensive gravity abscess in the lateral region of the neck, following the connective tissue sheath of the M. sternocleidomastoideus, or the sheaths of the large vessels of the neck, or towards the occiput into the neck). Until the publication of his paper (l. c.) Bezold had never seen a gravity abscess beneath the clavicle, under the sternum into the mediastinum and into the pleura, nor had he seen the so frequent caput obstipum.

Bezold, himself, has never raised any formal objection to the misuse of his name, but has patiently endured it. In his latest text-book, (1906) page 200, he gives as the ground of this designation that the existence of this symptom complex, "which in the literature is frequently called Bezold's mastoiditis," was experimentally investigated by him on the cadaver⁴. The experiment consisted in this, that Bezold, following the method of Henke, etc., injected a colored solution of gelatine, which became hard on cooling, through an artificial opening into the incisura mastoidea. The hardening fluid took a course corresponding to that of the pus in the living, between the deep muscles of the neck and throat. That his therapeutic proposition given in the article cited, viz., to make a drain through the mastoid into the incisura mastoidea, is not

to be recommended, Bezold himself will acknowledge, although he gave a case where healing followed this entirely insufficient and dangerous operation. (Facial nerve.) There is hardly an otologic surgeon today who would be satisfied with such a technic. Everybody would lay the diseased focus entirely bare, and would resect as much of the mastoid process as he found diseased, especially the entire tip, and, furthermore, would incise the abscess and follow it to its end. I consider this foundation of the term "Bezold's mastoiditis" on the experiment on the cadaver as insufficient, and I am of the opinion that it was long ago the duty of Bezold, on account of the literature to which I have referred, to disavow his paternity and to correct the error of his pupils and friends.

I gladly admit that by his work of 1881 Bezold directed general attention to a disease known and described before he did so, especially the attention of those physicians whose studies are confined to the literature of the day. But this does not prevent my entering a protest against this historically incorrect term, in spite of my recognition of the other efforts and labors of any highly honored colleague. (I refer to his careful and valuable investigations on hearing and deafmutism.)

III.

"HARTMANN'S TYMPANIC TUBE."

Formerly I incorrectly thought⁵ that Toynbee was the first to use a curved tube for direct introduction from the meatus into the antrum, through a defect in the drum. But neither in his article "Preventing Caries of the Petrous Bone and the Formation of Abscess in the Brain, in Cases of Disease Within the Ear"⁶, nor in his text-book, "Diseases of the Ear," did Toynbee make the statement that he used or recommended a curved canula for direct lavage of the middle ear. My mistake was caused by the fact that I was acquainted only with an abstract of the above article, which was inexact. In the original (l. c.), there appears only that in cases where the drum was absent and where there was retention of pus in the mastoid cells, Toynbee recommended the attempt to introduce a "curved probe" in the direction of the mastoid in order to make a path for the discharge of pus into the middle ear, and later to wash out the meatus carefully with warm water. In opposition to this method, Wilde⁷, declares it inadvisable and dangerous. He had never done it, nor had he ever seen it employed by others.

For those who have not access to the original, I will quote the exact words of Toynbee and Wilde. Toynbee⁸ writes:

"If the membrana tympani be absent, and matter is confined in mastoid cells, it is desirable by means of a curved probe to endeavor to make an exit for the matter through the natural channel into the tympanum and to use syringe with warm water carefully; by this means it is possible in some cases where the mucous membrane of the tympanum is not very thick, to secure the withdrawal of matter from the mastoid cells. etc."

Wilde⁹ in an article "On Aural Diagnosis and Disease of the Mastoid Process," says:

"To obviate the consequences alluded to, Mr. Toynbee recommends, in cases of ruptured membrana tympani, 'directing the stream of water in syringing through the orifice of the membrane into the tympanum in order to evacuate the latter cavity of its contents.' This is an achievement, I am afraid, we cannot always lay claim to, as, in syringing, the stream of water fills the meatus, no matter how it is directed. The next proposal is 'by means of a curved probe (passed into the mastoid cells) to endeavor to make exit for the matter through the natural channel into the tympanum. By this means it is possible, in some cases, where the mucous membrane is not very thick, to secure the withdrawal of matter from the mastoid cells.' I have never performed such an operation, nor seen it performed by others; I can, however, suppose it possible with the patient under chloroform, although not unattended with risk, if the probe could be pushed far enough and was curved sufficiently, or if the operator could succeed in thrusting it into one or the other of the mastoid openings."

My antrum tube was first made known and pictured in the Arch. f. Ohrenheilk., Vol. XIV, Nos. 3 and 4, p. 225 (published March 18, 1878), after I had been using it for years and had demonstrated it to be useful and without danger. Dr. Arthur Hartmann (Berlin) in the Zeitschrift f. Ohrenheilkunde, Vol. VIII, p. 28, 1879, in a note to his article "Ueber Sclerose des Warzenfortsatzes," stated that in syringing the middle ear and antrum mastoideum in cases of thickened masses, he used a tube of pure silver with its end bent at a right angle, whose end was inserted into the middle ear under guidance of the mirror. The other end of the tube was connected with a rubber tube by means of which the tube is joined to the syringe.

Later, Dr. Arthur Hartmann, in the *Deutsch. med. Wochen.*, November 1, 1879, No. 44, p. 573, wrote a special article "Ueber die Ausspülung der Trommelhöhle und ihre Ausbuchtungen." (The Lavage of the Middle Ear and its Accessory Cavities.) He begins with the false statement that I had discarded my former unfavorable judgment of this method as unjustified, after he had commented on the method in his article on Sclerosis of the Mastoid. His article, as stated above, appeared in the *Zeitsch. f. Ohrenheilk.*, Bd. VIII, 1-79, while my first publication of this antrum tube appeared a year before (*Archiv f. Ohrenheilk.*, Bd. XIV, H. 3 and 4, Sec. 225, March 18, 1878). The facts, therefore, are exactly the opposite of Dr. Arthur Hartmann's statement. One year after I had published my originally unfavorable judgment, Dr. Arthur Hartmann wrote an article for the *Zeitsch. f. Ohrenheilk.*, and still later one for the *Deutsche med. Wochenschrift*, in which he described and pictured an instrument similar to mine, which he called "tympanic tube" instead of "antrum tube," and in which he described the introduction of the tube with the aid of the reflector just as I (*loc. cit.*) had described it, and had always done and taught it to be done. In order to give his "discovery" more weight, Dr. Arthur Hartmann thought it best to add, at the end of his article, "the instrument which Schwartz (*loc. cit.*) described soon after my first article appeared, possesses a sharp curve in that part of the tube which lies in the external canal, but the deflection in the external part of the tube is missing, so that it seems scarcely possible to introduce it under illumination with the reflecting mirror."

Every word is wrong. But the very confident statement that it seems scarcely possible to introduce my tube with aid of the reflector, after I had used and taught it for years, might easily have been spared by Dr. Arthur Hartmann. His reasons for this statement are false premises. The "sharp curve" of the tube is to adapt it to the width of the meatus, since the tube is of pure silver and can be bent, and the "lacking deflection in the external part of the tube" is superfluous, since the soft rubber tube in which the canula is introduced bends of itself.

More than twenty years ago, I mentioned this act of Dr. Arthur Hartmann in my text-book¹⁰. This has usually remained unnoticed, otherwise "Hartmann's middle ear tube" would not have gained and retained until now the place in otologic literature which it has not deserved.

Jacobson¹¹ called the instrument, which I called antrum tube, by the name of S-shaped tube, which is not aptly chosen. since my tube has by no means a S-shape. His opinion, that my antrum tube is better adapted to lavage of the middle ear through an external opening into the antrum mastoideum than to lavage of the middle ear and antrum via the meatus, is not confirmed by my experience. I have neither used nor recommended it for that purpose. To my amazement, this false statement is included in the latest Jacobson-Blau book, as well as the unsuitable name S-shaped tube.

A. Politzer (Lehrbuch, 3 Auflage, S. 360) recommended, in addition to the "Hartmann canula" an elastic canula of hard rubber slightly curved at the point and bent at an obtuse angle externally, which he had used for a long time. I have never had an opportunity to use this since. I have obtained the same result with my metal tube and rubber tube, without giving the patient any pain or discomfort. A quiet and intelligent hand, guided by the reflector, can easily introduce it through the speculum into the wide meatus, and through the defect in the drum into the attic towards the antrum.

The idea of direct irrigation of the antrum did not originate with me, or with Toynbee (v. supra), as I formerly erroneously thought, since by "curved probe" is meant a probe curved at the end and not a curved tube or canula. The first to give distinct expression to the idea of introducing a curved canula directly into the spaces behind and above the middle ear and to use it for washing out the thickened pus, etc., was v. Tröltsch¹².

Whether he tried it on the living, he does not say, nor do I know anything further either from private communications or from his pupils. For the incitation to a practical use of this idea I thank this short statement in the very valuable work of v. Tröltsch.

It is not the importance of the instrument that causes this literary historical discussion, for I am aware that this intratympanic lavage usually does not cause a cure even with the very favorable absence of caries and cholesteatoma. In a case under my observation of a patient who was afraid of operation, it was used for 23 years regularly, without any other result than that she finally asked me to perform the long deferred operation on account of an increase in the symptoms. Afterwards, she was quickly cured. My instrument, however.

often is very valuable as a diagnostic means, since the condition of the masses removed from the middle ear indicates the nature of the disease of the bone.

The chief aim of these words is to prove that Dr. Arthur Hartmann did not show anything new with his middle ear tube, and I hope to accomplish the final disappearance from our literature of the term "Hartmann's tympanic tube." My reference to this in my text book of surgical diseases of the ear (1. c.) has apparently been unnoticed by many, otherwise there would be no reason for me to return to the truth of this scientifically unimportant fact.

If there were any need of giving the canula or tube a special name, it ought to have the name of the man who first suggested its use, namely, v. Tröltsch.

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XVII.

THE SUBMUCOUS RESECTION OF THE NASAL SEPTUM. SOME REMARKS BASED ON SEVENTY-FIVE CASES.*

BY LEE MAIDMENT HURD, M. D.

NEW YORK CITY.

In the series of submucous resection cases which forms the basis of this paper, I find that the number of males predominates over the females three to one. The average age is 27.2 years. The youngest patient was 10 years of age; five patients were under 15 years of age; the oldest patient was 64 years. The deflection occurred one-third oftener to the left than to the right. Only six gave a clear traumatic history, while in one-third of the total there was an indefinite traumatic history. In all these cases the bone as well as the cartilage was involved. Seven patients had previously been operated on with the saw or by the Asch method.

There were three perforations of the septum, equaling 4 per cent., one due to early inexperience, one to Ballenger's knife and one to a knife slipping off the anterior nasal spine while dividing a very thick periosteum. None of these perforations gave the patient the slightest trouble. Their only knowledge of their presence is from being so informed. One girl of 14 years had exophthalmic goiter which disappeared after the submucous operation. Another woman of 34 years had atrophic rhinitis with crusts on the concave side. She is now entirely well of that condition.

INDICATIONS AND CONTRAINDICATIONS.

The indications might be summed up in a few words by saying that any and all conditions of the septum requiring the removal of tissue should be done submucously. Do not misunderstand me; I do not advise a window resection for a small

*Read in the Section of Laryngology and Otology of the American Medical Association, at the Fifty-seventh Annual Session June, 1906.

spur, but I claim that it should be removed without sacrificing any mucous membrane. Deflections should be corrected submucously with but few exceptions, namely, recent traumatic cases where the component parts of the septum can be replaced.

The window resection should entirely replace the former methods of Asch, Gleason, Roe and others. In addition to the recognized pathologic conditions in which this operation is indicated and practiced, I have found where there are (1) a septum that is too thick, a condition which can probably be traced to some previous injury; (2) a thickened cartilage and much fibrous tissue between it and the anterior nasal spine, which may be abnormally high and thick; (3) the neurotic type where the thickening is high up on the septum. These all yield equally well to the submucous method.

The contraindications are few. Do not operate where there



Fig. 1.—The author's submucous elevator.

is any indication of active syphilis, acute rhinitis, hay fever, diabetes, or advanced tuberculosis. Pus in the nasal cavities due to sinusitis is not a contraindication.

METHOD OF OPERATION.

The method that I have employed is to make a curvel incision just in front of the deflection through the convex mucous membrane down to and slightly into the cartilage from the floor upward and forward as far as it can go, generally about one inch. Some operators claim that this incision does not give enough room for vision and attack of the bony deflections. I can only say that I have worked with a plain 32-candlepower electric lamp and can see perfectly and reach any portion of the septum easily with the submucous speculum in place. This incision I place just in front of the deflection. The mucoperichondrium is then elevated a short distance, or until it shows no adhesions, by using the sharp end of the elevator.

Then proceed with the reverse side or dull end of the elevator, which is made of copper, so that its shape can be adapted to any structural irregularities. It is sometimes impossible to elevate the membrane behind a very acute angular deflection until the cartilage has been removed above it. I now go through the cartilage to reach the membrane of the other side. I accomplish this by using a bone curette, thereby avoiding any injury to the opposite membrane. By this means I take out a strip of cartilage about one-eighth of an inch wide and half an inch long, which gives a sufficiently large space in which to start the elevation of the opposite mucous membrane with the sharp end of the elevator. This accomplished, I continue with the blunt end.

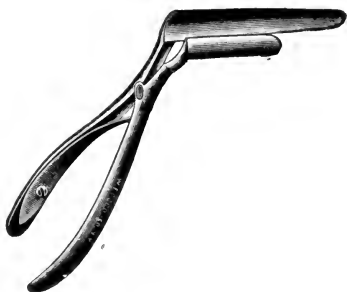


Fig. 2.—The author's submucous nasal speculum.

Now, having the mucoperichondrium and periosteum free on both sides over the deflection, the cartilage is removed either with my forceps or with a Ballenger knife. Introducing my speculum, which has a long upper blade and a short lower one, so that the long blade is uppermost at all times. I have a perfect view of the operative field, without lateral interference. With the same forceps used for the cartilage, the bony deflection is now broken away, first above the ethmo-vomer articulation, then below, generally bringing the thickened ridge with it.

I leave the anterior nasal spine until the last whenever it is possible to do so, as I have found that its mucoperichondrium is separated more easily from behind forward than the reverse, and because there is more tendency to hemorrhage at this point than at any other, on account of the two palatine arteries that

enter the spine from the foramina of Stenson. Sometimes there is a slight shock when this spine is broken off, on account of the severing of the nasopalatine nerves. The periosteum of the anterior nasal spine covers it entirely and the cartilage sits on it. At times it is so thick and tough that it is necessary first to incise it with a knife in order to separate it from the bone before using the elevator. If the periosteum is very adherent, I use the bone curette as an elevator; as soon as the periosteum is free the deflected bone is easily removed with the down-cut-

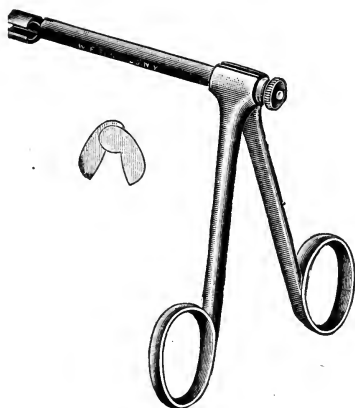


Fig. 3.—The author's down-cutting forceps for attacking the septal ridge.

ting forceps. This method is painless and there is no danger of injuring the mucous membrane.

I now remove the submucous speculum and coaptate the two septal membranes. If they are in the median line, with no bulging areas, the operation is complete. Should any deflection of bone or cartilage remain it must be removed, after which the sac formed by the septal membrane and the nasal chambers is irrigated with a mild antiseptic solution. The membranes are then coaptated and the two nasal cavities packed.

I have as yet found no entirely satisfactory form of packing. I formerly used Bernays' sponges, but they do not cover sufficient area and they create a pressure which can not be regulated. Lately I have been using gauze strips packed between two layers of guttapercha tissue. This with a hard rubber

splint on one side gives some opportunity for nasal breathing and is fairly satisfactory.

SPECIAL INSTRUMENTS NECESSARY.

I find four special instruments necessary, augmented by a few others that can be found in every rhinologist's armamentarium. The necessary instruments are an elevator, submucous speculum, and two pairs of forceps—one downcutting—which have been previously described.¹ Some form of knife is necessary for the initial incision. I personally like Myle's septum knife, set at right angles to the shaft, and a bone curette to go through the cartilage. These few instruments

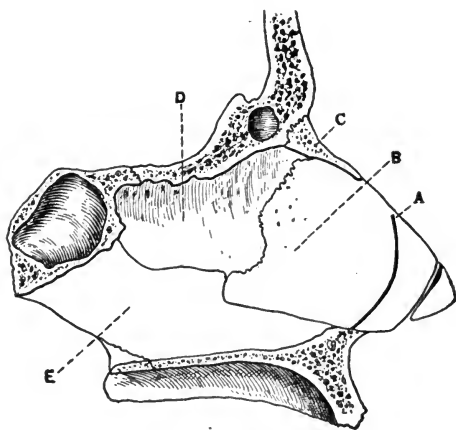


Fig. 4.—Nasal septum. A, curved incision; B, quadrilateral cartilage; C, nasal bone; D, perpendicular plate of ethmoid; E, vomer.

may be supplemented by more forceps of different sizes and a Ballenger knife. I am not as enthusiastic over the Ballenger knife as formerly, on account of two bad lacerations I have had from its use, accidents over which I seem to have had no control, but I still use it in young patients where I have reason to believe the cartilage is large. A smaller and thinner elevator can at times be used to advantage in traumatic cases.

COMPLICATIONS.

Among the complications following this operation the most annoying is the formation of hematoma. This forms between the septal membranes usually beyond the reach of the packing,

(1) Medical Record, Nov. 25, 1905.

or else after the removal of the packing. To prevent the formation of hematoma in cases liable to excessive bleeding, my custom is to place the packing in both sides of the nose, and allow that on the convex side to remain two days instead of 12 hours.

I have seen no septic infection, and there should be none if the operator is clean. I may say here that extreme attention to asepsis, such as covering a patient with sterile towels, disinfecting the nose and face, which I formerly used and recommended for a time, I now find it is not necessary, provided all instruments, the surgeon's hands and everything that goes into the nose is sterile. This method has given me good results.

IMMEDIATE RESULTS.

The nasal packing causes considerable discomfort. To some extent I have diminished this by using a hard rubber splint on the opposite side which gives the patient some breathing space. I find there is more complaint from the enforced mouth breathing than from the pressure caused by the packing. The first night there is considerable oozing of the blood-stained serum which is very annoying and often frightens nervous patients. There is a reactionary swelling soon after the packing is removed, which subsides in from two days to two weeks. For this condition I give an ointment containing 1 per cent. of menthol, which affords some relief.

ULTIMATE RESULTS.

The ultimate result achieved by this operation respecting nasal breathing particularly has been uniformly good. In some we have not only a deviated septum to deal with, but also a bulging of the turbinates which may be either bony or hyperplastic in character. This condition may be simulated by the septal deviation pressing on the turbinates or by a true bulging of the bone as well. In these cases after the septum has been placed in the median line, it will free the previously occluded side and partially close the formerly open cavity. If the bulging of the turbinates is due to a hyperplasia of the mucous membrane (which is often the case, due no doubt to a local vasomotor change caused by the deflected septum pressing against the opposite turbinate) the hyperplasia will gradually subside and in the course of a month or two the nose will have an entirely normal appearance. Should the bulging of the tur-

binate in the formerly open chamber be bony, it is best, in my judgment, first to place the septum in the median line and later to correct the shape of the turbinate by a submucous method, practically remodeling the nasal cavity.

The question now arises, Do the cartilage and bone regenerate? They do not. After a period of from one to two years I have examined most of my old cases and have found the septum flaccid to the slightest touch of the probe. From one patient, aged 14, I removed a section and submitted it to a microscopic examination and found only the two mucoperichondria with a small amount of fibrous tissue between them. As the septal ossification is not complete until the twelfth year I am keeping the few patients I have treated below that age under observation to see if there will be any regeneration. I do not

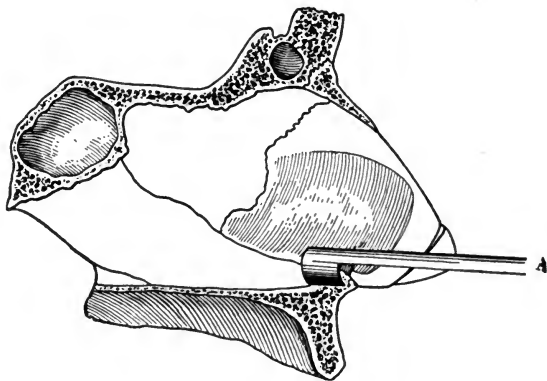


Fig. 5.—The shaded part shows the portion of the cartilage removed. A, the cutting forceps engaged on the anterior nasal spine or incisor crest and the vomer.

believe in leaving islands of bone or cartilage adherent to one membrane as nucleus for further growth of bone or cartilage, as one operator suggests, for I believe that this would rather act as a foreign body. I have had one patient complain of soreness across the dorsum of the nose and in columellar nasi on being moved from side to side even four months after operation.

The nasal profile I have never seen affected except in one

case, that of a child 10 years old who had one of the worst deflections I have ever seen. The tip of the nose was strongly bent over to one side and somewhat depressed. After several months there was a slight depression just below the nasal bone, but the physician who referred the case to me was of the opinion that there was no change in the profile.

I go as far forward in the cartilage as is necessary to remove the deflected portion, and have not had any sinking of the nose, but I do not believe that it is a good plan to start the cartilage resection at the free border, if it can be avoided, as in the few cases in which I have done so the **result** is a weak-

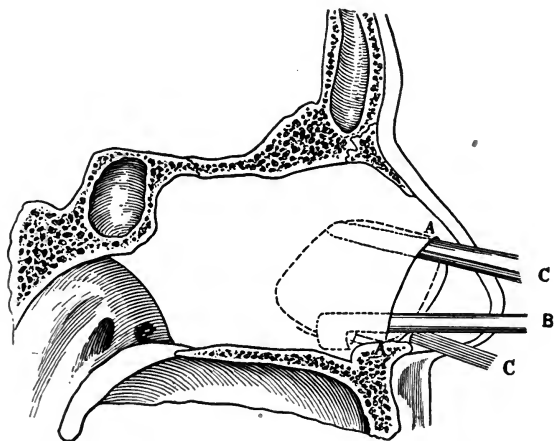


Fig. 6.—A-A shows the incision held open by the long blades of the speculum C-C; the dotted enclosure indicates the amount of cartilage removed; B, down-cutting forceps attacking the lower deflected border.

ened nose—at least the tip has not the same resiliency it had before operation, although there is no depression. I think it is better to leave a small strip of cartilage in front, running from the floor upward to the junction of the lateral cartilages. If this strip is badly deflected, replace it in the median line at time of operation or by a slight subsequent operation.

In regard to the interference with the nerves and blood supply caused by removing the anterior nasal spine or nasopalatine canal, I have attacked both whenever that portion was affected and have had no bad results of a neurasthenic nature.

therefore, I am strongly of the opinion that those who have advocated that theory find the anterior nasal spine hard to remove and use this means of excusing their faulty technic.

The mucous membrane of the septum, which before operation was congested and inflamed, generally becomes perfectly normal in color without any after-treatment.

At times the incision leaves a white linear scar, at others no scar is visible. Rarely there is a slight dryness of the membrane near the incision for several months afterward.

Perforations seem to give no trouble. The patients are only aware of their presence on being so informed, and there is no crusting about their edges. Theoretically an operator should have no perforations, but practically he will have a small number. As they cause no disturbance, I think there has been too much stress laid on the subject. Of course, it is pleasant not to have them.

The submucous window resection has now been sufficiently tested both in relation to number of cases reported and their ultimate results to place it on the firm foundation it deserves.

15 East Forty-eighth street.

XVIII.

TONSILLECTOMY BY ELECTRO-CAUTERY DISSECTION.*

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"Removal of Tonsillar Hypertrophy by Electro-Cautery Dissection" is the title under which I originally described this operation, the paper being first published in the *Journal of the American Medical Association*, November 22, 1890.^{1, 2} The operation was designed and first put in practice at my clinic at the Chicago Post-Graduate Medical School in January of that year and, as the results attained were highly satisfactory, I continued to employ it in both clinical and private practice though, as with every original procedure, it has with time and increased experience, passed through certain evolutionary changes, so that the technic I at present employ is somewhat different from that employed at the start.³

Difficulties were, from time to time, met which were successively overcome, particularly by improvement in the instruments and apparatus employed. At first, it being the age of the storage cell, I had to contend with the usual train of troubles which were common with that style of device for furnishing the electro-cautery current. Since adopting the excellent transformer of the Victor Electric Co., I have had no further trouble in securing the required volume and amperage of current so the cautery points can be heated to the desired degree and continuously maintained thereat. The transition from storage cell to transformer relegated to the past the disagreeable experience of being compelled to either postpone or discontinue a partially executed operation owing to the running down of a vasculating cell.

The operation of "cautery dissection" was designed in order that flat and degenerate tonsils could be removed in their en-

*Read at meeting of the Tri-State Medical Society at Galesburg, Ill., June 26-27, 1906.



Fig. A. Fauces in repose with left tonsil partially covered by hypertrophied anterior pillar or plica triangularis.

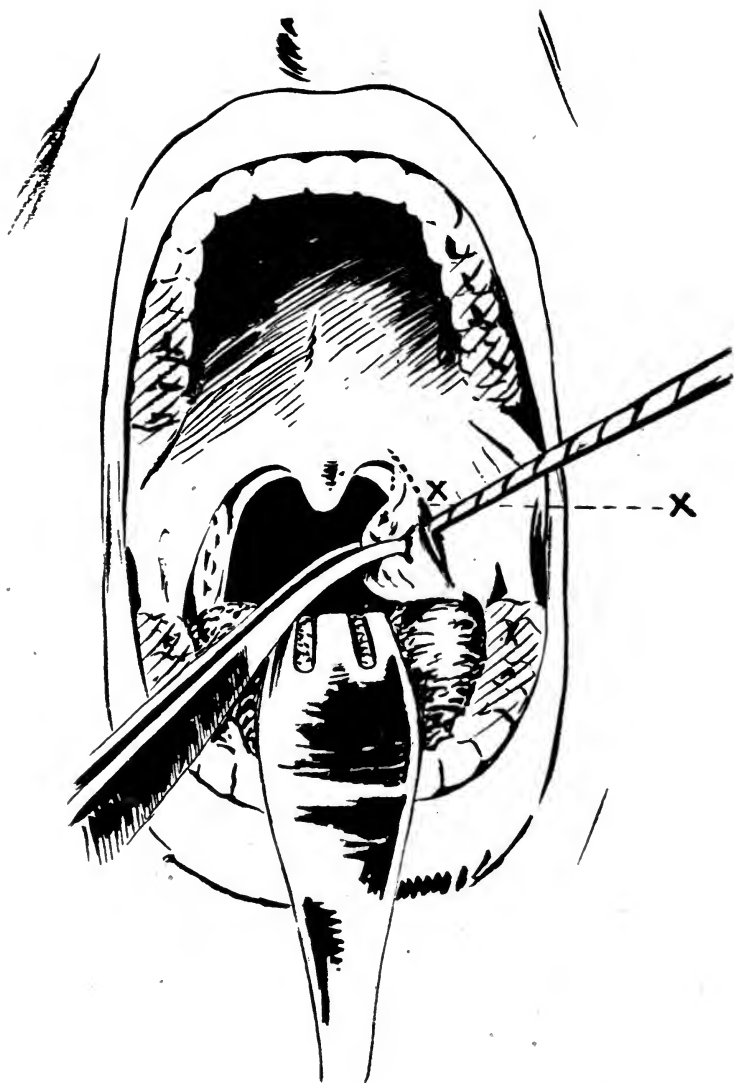


Fig. C. Showing first or primary incision beginning at point X and succeeding incisions by dotted lines.

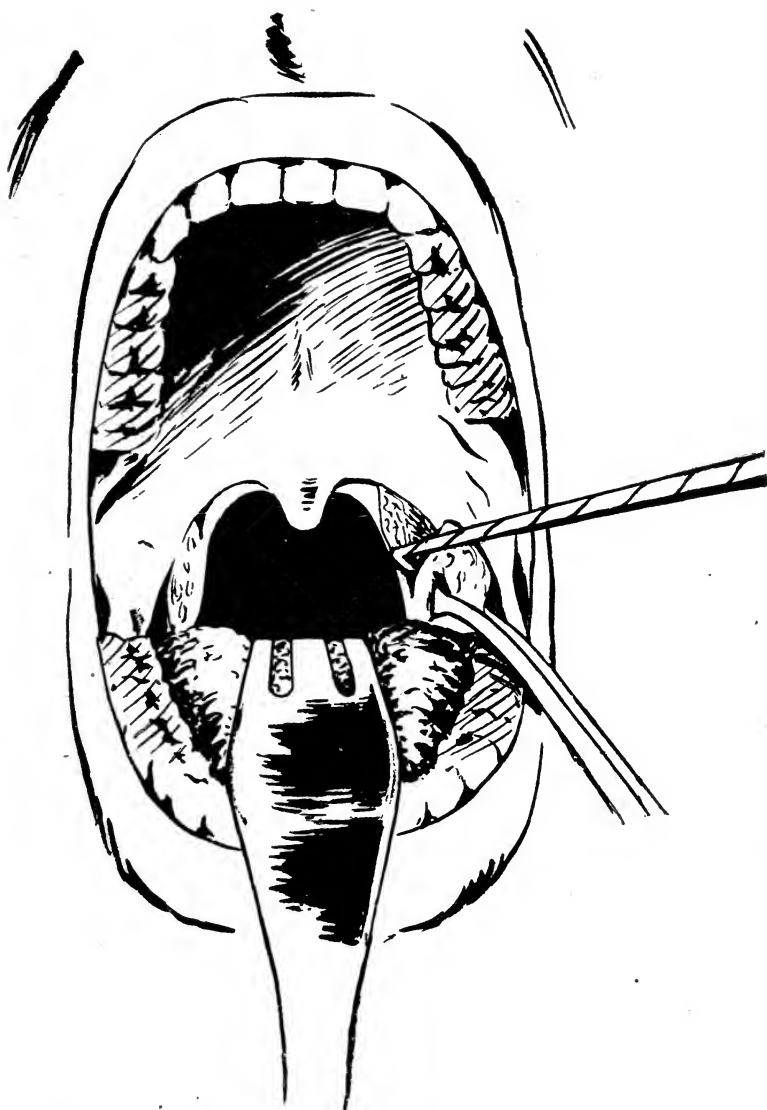


Fig. D. Showing posterior incision.

tirety, as there can be no valid argument advanced for allowing to remain any of a tissue which is decidedly pathologic from base to surface, a tissue which can at best be regarded as only the remains of a former tonsil. Many of my operations are done to remove the diseased base remaining after a previous tonsillotomy.⁴

In early life the tonsils are detrimental chiefly on account of their size whereby they act as an obstruction to respiration. If not at this time removed by the operation of tonsillotomy, the protruding portion of the tonsil gradually diminishes in size, hence the claim of the old-time doctor that nature effects a cure through atrophy. The fact is that as the protruding portion diminishes the buried base increases in size, hence the transition is largely a process of submersion. Furthermore, this change is brought about by a low grade of inflammatory process during which the lymphoid element melts away while the follicular element relatively enlarges, hence a formation ensues of large crypts and lacunae from which caseous fetid material can be readily expressed. By the use of a bent probe it can be demonstrated that the crypts are as much as one-half inch in depth.⁵

A tonsil of this description may easily escape the eye of the inexperienced observer as it is often hidden behind the anterior pillar and may even in fact lie at the bottom of a distinct concavity between the pillars, so it can be seen only when drawn up from its bed by the use of a volsella forceps, or when the patient is caused to forcibly gag, when a bulging ragged mass is revealed (Fig. B). When this condition of the tonsils is present all of the mucous membrane back of the anterior pillars will be excessively red and more shiny than normal, constituting a chronic pharyngitis, while, on the pharynx, granular enlargements are not infrequently observed. A thickening of the lateral bands of the pharynx is also frequently present to which has been given the name pharyngitis hypertrophica lateralis. Between this area of redness and the mucous membrane, further forward, there is a distinct line of demarcation, intensified when the patient gags, and forming an arch the upper and central portion of which is lost in the uvula which serves as a keystone (Fig. B). A free amount of frothy saliva completes the picture.⁴

The tongue is usually coated, indicative of digestive disturbance, and not infrequently an offensive breath is observed.

Constipation is generally a symptom. The throat is often acknowledged to be sensitive and easily affected by exposure during inclement weather. One or more attacks of acute tonsillitis at some time in the past is often reported. If the patient is a vocalist the voice will be described as being unreliable, or instead, the report may be that of a "lost voice." A spasmodic cough will at times be mentioned and can often be excited by touching a sensitive point on the tonsil. There will also occasionally be observed a swelling and tenderness of the sub-maxillary or deep cervical lymphatics. While submersion of the tonsil is a condition most often seen in adults it will not infrequently be observed to a certain degree in children when it may be described as a condition of semi-submersion.

The submerged or degenerate tonsil is often present without the patient having the slightest suspicion of its presence, as there is never experienced any degree of acute inflammation. There are, however, other manifestations due to the tonsillar trouble which are rarely associated therewith by the patient.

As in several cases, a susceptibility to acute attacks of coryza has subsided after a radical removal of diseased tonsils, it became clear that the latter had a causative influence upon the former. Tubal occlusion with the secondary middle ear manifestations, and particularly tinnitus, are often benefited by the total removal of diseased tonsils. The relationship is well recognized between catarrhal conditions of either the pulmonary or gastro-intestinal tracts and the descent of mal-secretions from the nasopharynx.⁶ As an active pair of degenerate tonsils can yield a much larger daily crop of pathologic material than usually falls from the nose, it is safe to give the tonsil credit for being the greater evil of the two, particularly when by microscopic and bacteriologic tests the secretion therefrom is found to be even more noxious than the other. And again, while the secretion from above is felt by the patient and is, during waking hours to a large extent expelled by expectoration, the secretion from the tonsils is chiefly squeezed out by deglutition while eating and hence is swallowed unobserved. And again, while postnasal secretions cause systemic infection mostly through their descent to either the pulmonary or gastro-intestinal tracts, a different condition exists as to the disposition of the toxic secretion generated in the diseased tonsil, for it is equally prone to being directly absorbed through either the lymphatics or the blood and is thus at times the distinct cause



Fig. E. Showing top of tonsil being pulled out as puncture is being made.



Fig. F. Showing the bottom incision.

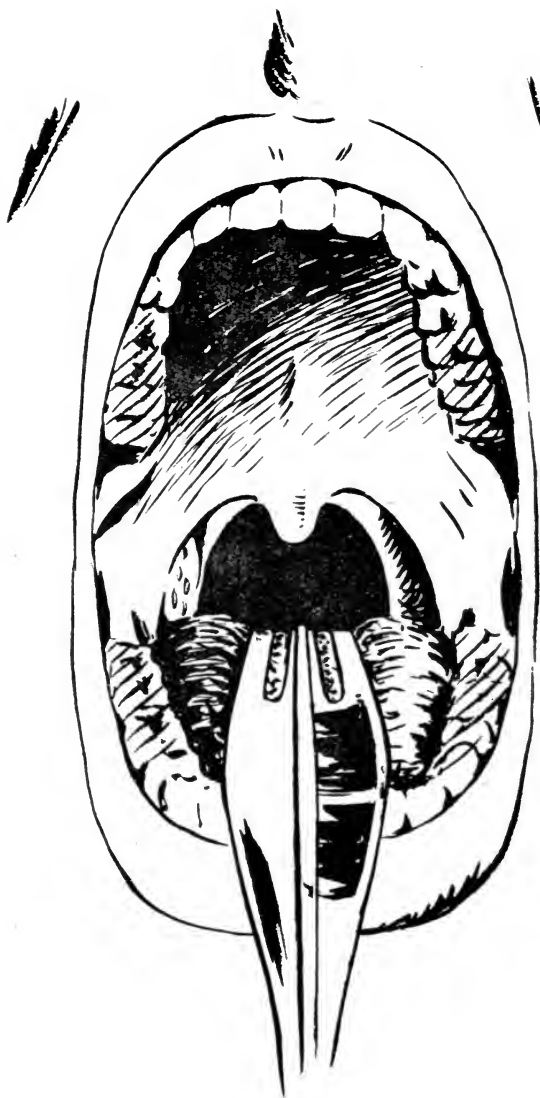


Fig. G. Showing left tonsil out and tongue depressor with saliva ejector attached.



Fig. H. Showing both tonsils out.

of systemic trouble at distant points.^{7, 8}

As tubercular germs are frequently found in the tonsils much attention has of late been given to this avenue for systemic infection. The intimate connection between the tonsils, the deep cervical lymphatics and the pleural cavity has been observed by different writers and explains the ease of pulmonary invasion as shown by Wood⁹ in a recent paper based upon his personal experiments as well as upon the findings of other investigators.

Having become fully convinced of the pathologic nature of the degenerate tonsil, the question arose as to the best method for its thorough eradication. Owing to its being to a large extent submerged (Fig. A) it was necessary that the successful operation should leave a pronounced depression or concavity instead of a plane surface as after ordinary tonsillotomy. Furthermore, as the operation was chiefly to remove diseased tissue, it was more essential that the incisions should be made with deliberation and in as nearly a bloodless field as possible. The most feasible plan seemed to be a dissection with a cautery point as, when properly operated, each little vessel should be sealed as it is severed, thereby giving the bloodless field so much desired. It must be remembered though that if the point is too hot it will cut like a knife and not close the severed vessel, while, on the other hand, if not hot enough it will not advance through the tissues, nor will it properly release itself from the eschar, and will thus tear the same, so in either event hemorrhage must ensue. An electric generator is therefore required whereby the desired heat of the cautery point can be maintained, which I found to be nearly a white heat when exposed in the open air.

If the patient possesses an intolerant throat, as is generally the case with degenerate tonsils, I direct him to practice several times daily for a few days a sort of drill whereby the faucial intolerance can to a large extent be overcome. This drill is much like that of the sword swallower and consists of titillating the fauces with different substances, as the finger, a spoon, handle, the handle of a tooth brush, etc. In order to instruct the patient as to the method I give him a printed sheet of directions in which is fully described the course to follow. I never operate when there is present an acute inflammation.

A sufficient anesthesia is generally secured by swabbing the parts with a solution of cocain. I use a large cotton applicator

(Fig. 1) and have the patient make the application once a minute for about twenty minutes, one swab serving for six or eight applications, when a fresh swab is given him. For the first two swabs I use a 10 per cent solution of cocain while for the third swab a 20 per cent. solution is used. I caution him to expectorate from time to time and not to swallow the cocain. My preference is to operate after the patient has had a hearty meat meal, in this way diminishing the tendency to intoxication from the drug. I do not call to mind ever having seen a prostration from cocain when thus used in the fauces. My solutions contain one-half as much carbolic acid as there is of the cōcain. In one case a complete anesthesia was secured from the use of only a 5 per cent solution, though my usual custom is to use the 20 per cent. solution as described which is effective in 90 per cent. of cases so but little or no complaint is made as to pain. Occasionally I have to use a 33 per cent. solution and have in a few cases applied powdered cocain on the moistened swab which gives 100 per cent. or full strength. In rare cases the patient is not anesthetized by local applications so I resort to other methods. In a few cases I have employed cataphoresis with success, using a special applicator (Fig. 2) for the positive current, though I more often use deep injections of a sterilized one-half of one per cent. solution of cocain without the addition of carbolic acid. For this purpose I employ my tonsil hypodermic syringe¹⁰ and find very delicate needles the best for deep injections. I formerly injected only beneath the mucous membrane of the pillars so as to produce a bleb, but I have lately been convinced that the deep injections are more efficient when injected deep into the pillars as well as into the base of the tonsil, only a few minims at each point selected, say at a dozen or more points (Fig. 3).

By resorting to either or both of these latter two methods, in conjunction with the swab, I can secure anesthesia in all cases. During the operation if a sensitive point is reached I apply for a moment a 20 per cent. swab in the wound. In any case where excitement is present, or a prostration is feared, it can be either overcome or averted by giving a ten drop dose of a preparation made from an extract of wood-violet to which strophanthus and calabar bean are added.¹¹

I am at present using a cautery handle which differs from the one I formerly employed.¹² The essential feature in this new handle is that the contact is secured by the sliding of

one tube in another whereby the possibility of corrosion is overcome and a perfect contact always secured. By a spring mechanism the current is automatically broken as soon as pressure is released from the contact lever. The electrode sockets are made extra long and are also conical, as well as the handle ends of the electrode, so perfect contact and a tight fit is secured which is entirely free from the usual and annoying wobble heretofore always present. This new handle has been made in accordance with my suggestions by the Victor Electric Co. A windlass for the hot snare, while not shown in the cut, is supplied with the handle (Fig. 4).

The electrodes I now use are of a new style made by the Converse Electric Co., and are capable of thorough asepsis, being



Fig. 1. Cotton Applicators (two-thirds size).



Fig. 2. Electrode for cataphoresis (two-thirds size).

made of two semicircular wires twisted about a strip of fibre (Fig. 5). For tonsil work I have them $5\frac{1}{2}$ inches in length. The burning point is of iridoplatinum, No. 24 gauge. I have used a larger wire (even as coarse as a No. 20 gauge) in order to get greater rigidity when heated. By having the cautery rheostat correctly placed the No. 24 gauge gives the best results and if not pushed too fast, in other words, if allowed to burn its way through the tissue with moderate traction, it will not bend out of shape. The disadvantage of the coarser wire is that it radiates too much heat. A red hot needle can be held quite close to the cheek without inconvenience, while a red hot poker held at the same distance would burn, and yet the degree of heat would be the same in each case, though the volume of heat bears direct ratio to the bulk. Additionally, the finer the wire the more rapidly it both heats and cools, which is of great advantage in this work. By using the finer wire, the burn is

more superficial and therefore causes less soreness than did the coarser wire which I formerly employed. The points are bent in two directions, either vertical or lateral from the line of the handle, and are reversible, though in use the electrode is geneally so placed that the point inclines downward. In the illustration different degrees of bend are shown, Nos. 1 and 2, at an angle of about 45 degrees, being most often required. There are, though, conditions in which Nos. 3, 4 or 5 are more convenient to use.

The cords are extra heavy and five feet in length. With nervous patients a head rest is at times advantageous. With the new Allison rhinological chair, a good head rest is furnished and any desirable position or degree of elevation of either seat or back is easily attained. While not a necessity, a

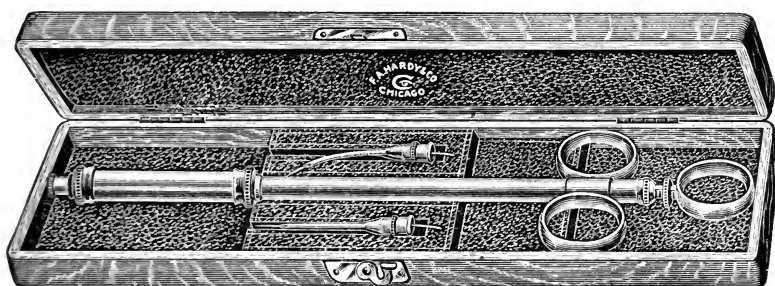


Fig. 3. Tonsil Syringe (half size).

good fountain cuspidor is more than a convenience and gives an extra advantage owing to the saliva ejector attached.

During the operation I have the patient with his right hand manage the tongue depressor, which occupies his mind. Furthermore he is less liable to induce gagging than when the tongue depressor is held by an assistant. Latterly I have had a saliva ejector attached to the depressor (Figs. 6 and G), whereby either blood or saliva is promptly removed so the patient does not interrupt the operation to expectorate. When operating without the fountain cuspidor the same tongue depressor is employed minus the ejector.¹⁰

Being right handed I generally operate the patient's left tonsil first. For this tonsil an electrode is used, the point of which is so bent as to be in line with the handle (No. 2 L, Fig. 5). The tonsil is then securely grasped near its center with the

mouse-toothed No. 1 forceps (Fig. 7) and forcibly lifted from its bed. It will thus be seen to rise and move about beneath the anterior pillar and its anterior boundary will be but slightly back of the previously described line of demarcation, while the top of the tonsil will be found to be as high or higher than a horizontal line drawn from the base of the uvula. The heated cautery point is then entered to a depth of nearly one-half inch at the anterior margin of the tonsil, quite near to its superior border, and a slightly curved incision is made downward about parallel with the demarcation line, the tonsil meantime being pulled outward and backward (Fig. C). Instead of one long



Fig. 4. New Cautery Handle (three-fifths size).

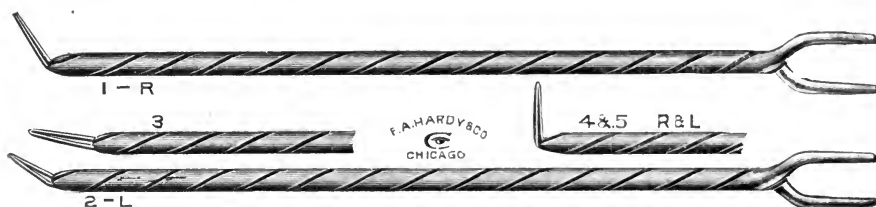


Fig. 5. Tonsil Cautery Electrodes (four-fifths size).

incision a series of shorter incisions or dissections is more often made down or near to the pillar attachment to the tongue, becoming more shallow as the bottom is approached. A return is now made to the starting point and by one or more shallow incisions the upper margin of the tonsil is followed to an apex above its center by upward strokes when by downward and deeper cuts the tonsil is separated from the posterior pillar, the traction meantime being changed to outward and forward (Fig. D). The tonsil forceps is now made to grasp the upper portion of the tonsil and, with suitable traction either forward or backward as required, by continuous dissection the top of the tonsil is disengaged from the supratonsillar fossa so the remaining depression at this point will be about five-eighths of

an inch in depth. After the top of the tonsil is thus thoroughly released, with the traction continued as before, I next make a downward puncture in the middle of the wound with the heated point at the junction of the tonsil with the pharyngeal aponeurosis (Fig. E), and from this puncture dissect forward until the front margin is reached, when, by a return to the point of puncture, I dissect rearward to the posterior margin. In this way the incisions are gradually continued downward and outward at an angle so as to be near the surface when the bottom is reached. By now pulling the tonsil upward and changing the position of the electrode by entering it at the bot-

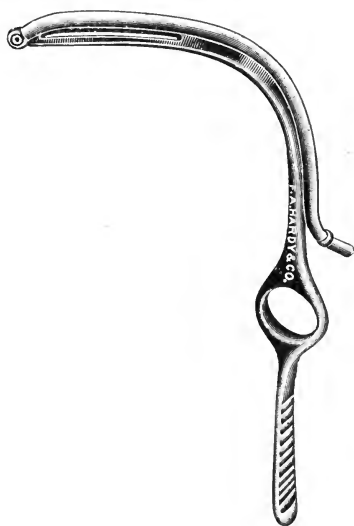


Fig. 6. Tongue depressor with saliva ejector (one-fourth size).

tom of the primary incision, point upward and handle tilted about 20 degrees above the horizontal, with one or two curved backward strokes (Fig. F) there is reached the bottom of the posterior incision and the tonsil is now attached by only a pedicle near its bottom, which can be readily severed by first placing the electrode with point turned downward and outward against its front edge as the tonsil is being pulled outward and backward, when with a firm backward and upward lift with the electrode the tonsil is swung well forward so as to stretch the pedicle over the cautery point, which is then heated and the pedicle severed. At times this same method of procedure

can be advantageously employed at other and preceding stages of the operation, and in removing remnants.

As during the entire operation firm outward traction upon the tonsil is employed, the work is in reality all done in plain sight, and not in a hole, though after the finish a deep hole remains, deepest at its upper margin and gradually scaling outward to the surface at its base, hence the submerged tonsil somewhat resembles in shape an iron wedge. The remaining wound is much larger than the tonsil removed, which is in part due to some tissue having been destroyed by the cautery but more to the elasticity of the pillars after being disengaged from the tonsil which previously bound them together. (Fig. G).

The pulling out of the tonsil as described is permitted by the stretching of the cellular tissue beneath the pharyngeal



Fig. 7. Spring tonsil forceps No. 1 (three-fifths size).

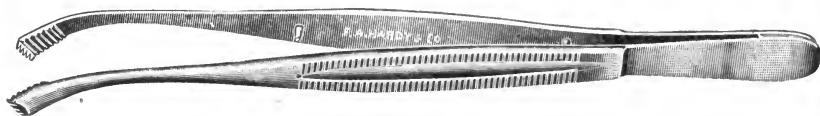


Fig. 8. Spring tonsil forceps No. 2 (three-fifths size).

aponeurosis, which latter constitutes the bottom of the resulting wound. In fact this structure, by the strong traction when the operation is half way done, may, if not too much bound down by inflammatory adhesions from preceding attacks of quinsy, bow outward to such a degree that the dissections, instead of being on the line of a concavity, are really on the line of a convexity, like the peeling of an orange, in order not to penetrate the aponeurosis. The direction of the incision being made can at any time be easily ascertained by releasing the forceps traction for a moment when the parts will resume their normal position.

In this way the entire tonsil is removed, including all of the pathologic follicular element. Formerly I divided the operation in two steps, two weeks apart, removing at first only the upper half, but latterly I remove the entire tonsil at a sitting except in

rare cases where hemorrhage is encountered. In some cases the surface of the tonsil is so rotten that the No. 1 forceps tears out. In such cases I use the No. 2 forceps with more mouse teeth and further fortified with opposing serrated surfaces (Fig. 8). These latter are often convenient for grasping sidewise, either front or rear, any small remaining remnant. These forceps are both spring forceps which automatically disengage and release their hold as soon as pressure is removed and have no spring lock, which I consider a detriment.

Occasionally, where the tonsil is bound down by previous acute inflammatory attacks, in combination with the friable or rotten surface alluded to, a forceps is required which will take a more forcible and deeper hold, when I employ my scissors vulsellum tonsil forceps (Fig. 9) with best results.¹³

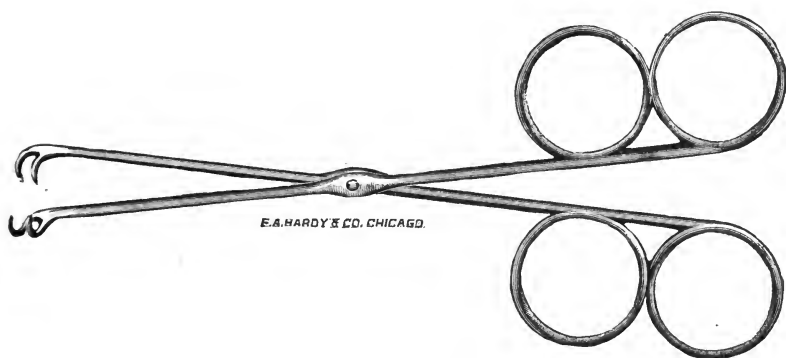


Fig. 9. Scissors vulsellum tonsil forceps (two-thirds size).

It occasionally occurs when faucial intolerance is pronounced, and when the tendency to gag is increased by the tilting over of the nearly detached tonsil so it touches the tongue, that instead of completing the operation with the cautery point I sever the pedicle with the cold snare,¹⁴ which causes a moderate amount of hemorrhage, though easily controlled by iced gargles. I also use the snare (Fig. 10) in the same way for completing the operation if the operative field is much obscured by hemorrhage.

The operation as described usually requires from ten to twenty minutes, though in one case I removed an entire tonsil in two minutes and a half. This operation, particularly in a

sensitive throat, requires a certain degree of dexterity which can only be acquired by practice.

In this operation as described, it might seem to the spectator that the patient is being needlessly robbed of a good deal of the anterior pillar. Formerly I tried to leave all that seemed to be pillar, though it necessitated the formation of a pocket in the wound if all of the tonsil was removed, and thus gave increased discomfort and also retarded healing. Another and more important fault from trying to leave all of the pillar was the failure to remove all of the tonsillar tissue lying beneath this pillar covering and hence a continuance to a limited degree of the pathologic condition which the operation was intended

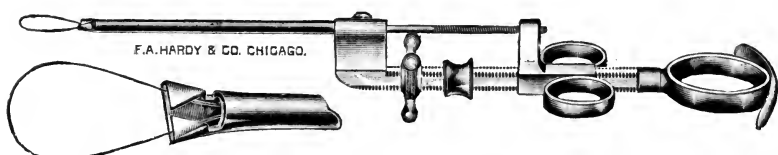


Fig. 10. Author's tonsil snare (one-third size).



Fig. 11. Tonsil presser (one-half size).

to remedy. I soon became convinced that in this condition of the tonsil, the anterior pillar was also hypertrophied and that the posterior half thereof which covers the tonsil was chiefly a mucous membrane containing little or no muscular tissue, it being often spread out so as to cover the lower half of the tonsil. (Fig. B, left tonsil.) In some cases this lower portion of the anterior pillar, when extending backward over the tonsil as described, is so thick that it may be mistaken for a portion of the tonsil itself. In no case by following my described line of incision has the patient after healing of the wound given evidence of having sustained any loss of either structure or function.

With the submerged tonsil the posterior pillar is generally quite thoroughly attached thereto and has often lost all structural resemblance to pillar tissue, seeming instead to be a part

of the tonsil. In fact the two pillars and intervening tonsil often constitute an agglutinated hypertrophied mass, so when the throat is in repose it presents simply a flat surface. In all cases I dissect out a posterior pillar, which during the process of healing assumes the appearance of a normal pillar notwithstanding its previous degenerate aspect.

In operating the second or right tonsil, generally two weeks after the first, being right-handed, I at the start use an electrode the point of which is nearly in line with the shaft (No. 3, Fig. 5), and with this make the primary incision at the posterior edge of the anterior pillar, as well as the second incision to the apex, and then a short start downward on the posterior incision, but after this I change to an electrode the

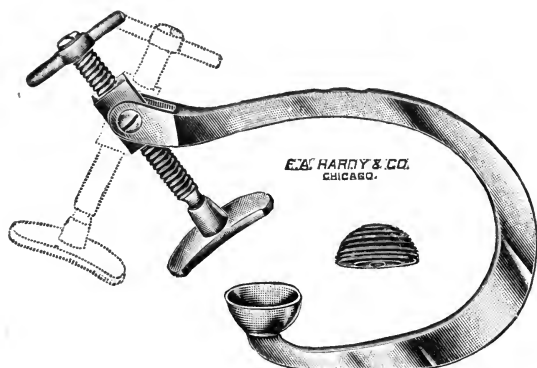


Fig. 12. Author's tonsil hemostat (one-half size).

point of which is so bent as to be at a right angle to the line of the handle, the bend being downward. (No. 1 R, Fig. 5.) Another difference which follows this change of bend is the following: When operating the left tonsil, in the making of all downward incisions the handle is swung from the horizontal downward 90 degrees to the vertical, while when operating the right tonsil the handle is held horizontal most of the time, downward incisions being made by a downward and outward pull either forward or rearward. After the change is made to the angular electrode, the operation is continued much as before described when operating the left tonsil, except when making the bottom surface incision I enter the point at the bottom of the posterior incision, the handle, meantime, being swung downward and beyond the vertical to the extent of about

20 degrees which causes the electrode point to tilt upward to the same degree, and cut forward to the bottom of the primary anterior incision; also while severing the pedicle, I enter the electrode at the rear thereof the point tilting upward as before and cut forward and outward, in this way reversing the process employed with the left tonsil. For these last two steps, if time is taken to change electrodes, a more convenient way is to use a left tonsil electrode so placed in the handle that the tip points upward.

After the tonsil is half removed, the wound being dry, I swab all the traumatic surface including that of the loosened tonsil with a 90 grain solution of argenti nitras before separating the lower half. In this way if a little hemorrhage occurs while doing the lower half the parts painted with silver are not so likely to bleed by sympathy. Before doing this I have seen bleeding extend to all parts of the wound if a little bleeder is struck at any time when near the end. In this way by the use



Fig. 13. Tip of lateral swing atomizer (full size).

of silver and careful work, I frequently remove a tonsil without the loss of a single drop of blood from the wound, and without the saliva being discolored by the few drops of blood which always exude at the points where the forceps takes hold. In case a slight hemorrhage begins at any point it can generally be stopped by a series of touches with the cautery point at a cherry red heat, and often without the knowledge of the patient, so he may not know but the operation was bloodless.

As the tonsil has such a rich supply of blood, and is in such close proximity to the larger vessels, branches of which are at times either anomalous or enlarged, any tonsil operation is likely to produce a hemorrhage. In my experience hemorrhage has been much less frequent in late years than formerly, which is in part due to improved technic, though largely due to the taking of more active and prompt steps to control it in its incipency. A large majority of all hemorrhages occurring can be controlled by gargling with an iced alum solution or by the use of the tanno-gallic acid mixture.³ When these fail a hypoder-

mic injection of either ergotole or morphin is generally effective, particularly in combination with the feeling of faintness which is often produced by the injection.

For the control of tonsillar hemorrhage, pressure is the most positive procedure to adopt and in case of a little spurter it can generally be arrested by digital pressure if promptly applied. pressure is required, it is wise to apply a tonsil hemostat (Fig. 11) the pad of which may if desired be moistened with a hemostatic, Monsel's solution being the best. In case prolonged pressure is required it is wise to apply a tonsil hemostat (Fig. 12). In an experience of seventeen years in tonsil work I have applied the hemostat only four times, in two cases it being done to hasten the stoppage of a hemorrhage which gave every evidence of being near its finish.¹⁴

Owing to paralysis of the muscular coats of the vessels from the cocain a delayed primary hemorrhage is liable to occur within twelve hours of the operation, though this rarely occurs in favorable cases if the patient follows directions by avoiding all physical exertion and prolonged efforts at conversation. I also advise against the recumbent posture during the first night's sleep and recommend passing the night in a tilted rocker or a reclining chair. The greatest danger point is 10 or 12 hours after operation when the patient drops in a dose and begins to snore. When the vessels are atheromatous, as in rheumatism or kidney disease, or after a life of intemperance, there is an increased liability to hemorrhage. Women are less liable to hemorrhage than men.

The fatalities reported after tonsillotomy have generally been due to the leaving of a fibrous base which prevented the closure of bleeding vessels. In case of a fibrous tonsil the operation of cautery dissection gives greatest promise of immunity from hemorrhage as the lines of incision are below the fibrous tissue.

Occasionally following the operation there is some febrile reaction which is relieved by one drop doses of the tincture of aconite given hourly. If the tongue becomes much coated I order one or two doses of sulphate of magnesia. Secondary hemorrhage may occur at any time during the first week from the separation of portions of the slough, though this is rare and the likelihood of its occurring diminishes day by day from the time of operation. In any event if it occurs it can be quickly controlled by iced gargles.

As an after-treatment I advise soft foods for a few days and the frequent use of a gargle of Merck's bicarbonate of soda, about a dram to a pint of water. I also advise the use every hour or two of an antiseptic gargle.

During the daily office treatments I first spray the wound with the D-P solution,¹⁵ using low air pressure. As the spray is to be directed sidewise, and as it is desirable to hold the spray bottle upright, a device is advantageous whereby the former can be accomplished. At my suggestion the DeVilbiss Mfg. Co. modified their excellent atomizer so this can be done, and as the revolving end piece can be swung about laterally as desired it is equally suitable for either side (Fig. 13). As a local application after the spraying, I have found nothing better than "eisen-glycerin" consisting of equal parts of tincture ferri chloridi and glycerin, with which the wound is daily massaged with the long bent cotton applicator, gently at first, but with increased vigor as the soreness diminishes, in order to remove adventitious granulations and make the wound heal up smooth and solid. While most patients prefer soft foods for a week or ten days I have had a few cases wherein there was practically not the loss of a meal. After the first week the progress is very rapid and the wound is practically healed in two weeks' time. In order to guide the patient properly as to diet and other after-treatment, as well as to direct what to do in event of an emergency as a hemorrhage, I give him a printed sheet of directions in which is incorporated all needed advice. By this operation, it is rare that the patient is incapacitated for attending to his usual duties.

During the operation of tonsillectomy in case of a "small diseased" or degenerate tonsil, it is no uncommon occurrence to encounter cysts which are filled with a softened cheesy and malodorous secretion, which cysts are at times as large as a good sized green pea.*

As to the results derived from the operation described, the patient, in addition to a permanent immunity against future attacks of acute tonsillitis¹⁶ will experience such improvement in the general health as might be expected from a loss of the former contaminating influence derived from diseased tonsils, hence the operation is recommended not only to relieve past or present bad effects but also as a prophylactic step whereby future troubles are averted, as for example, chronic catarrhal deafness or the chances of tubercular infection.

Following the operation, there is almost an invariable improvement in digestion and assimilation with an increased intestinal activity, whereby the former constipation is corrected, as well as the bad breath. There is often an increase in weight and clearing up of a former muddy complexion¹⁷ which is always appreciated by lady patients. The tendency to rheumatism is also diminished, or quite likely if present an eventual cure thereof is attained.

Furthermore, a marked improvement follows as regards the former faucial redness with a fading away of the granular pharyngitis, and, if a vocalist, an improvement in the singing voice with an elevation in the high register of two or three notes.¹⁸

Correct patterns of the instruments I employ in this operation are kept in stock by F. A. Hardy & Co. of Chicago.

103 State street.

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XIX.

OBSERVATIONS IN ONE THOUSAND ADENOID OPERATIONS.

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The adenoid condition is one which is becoming increasingly familiar to the public as well as to the medical profession; so much so that there is almost a danger of "fadism" on the part of the laity, and charlatanism in some sections of the profession; and even between these extremes the operations are attempted by those who are unacquainted with the operative field and its adjoining structures, and others who have some anatomic knowledge but no technic which is very necessary for careful, safe and complete operation. Certainly, no surgeon would think of performing an operation on a part, the anatomy of which he was not familiar with, or where the results of a poor operation would be visible to the family and friends of the patient. Yet some do not hesitate to plunge into the dark depths of the throat, stir up a lot of bleeding, and mutilate the organ which, although it may not be seen by any one, is, nevertheless, a constant source of annoyance and sometimes of serious trouble to the patient.

It has been my privilege to witness this operation in several of the larger throat clinics of Germany, England, and the United States, and I have thus been allowed a choice of method, from the dry scrape with the Gottstein curette without an anæsthetic, and a decidedly wet operation in the recumbent hanging head position, where it seemed as though the child would drown in its own blood.

The relation of this subject to the family doctor is one of the greatest importance. There is yet a remnant of the generation of doctors who, ignorant of the irreparable damage done to the mouth, throat, and delicate structures of the ear during

the years of the growing child, discourage operation advising that the child will outgrow the trouble. Then some of the younger generation advise operation indiscriminately; and again, we have a few odd examples like the man who says every child should be operated upon three times before it can be cured; or the man who simply lacerates the growth in very young children with his finger nail, telling the parents that another operation will be necessary in a few years for a cure of the condition. Then, too, there is the extremely careful man who removes the tonsils at one operation, and the adenoid at a subsequent operation; and the extremely thorough man who takes out everything there is, sometimes leaving the bone bare, sometimes removing the Eustachian tube cartilages. There is one case I have in mind of a colleague in a neighboring city who was consulted by a physician in behalf of his own child who had intermittent attacks of deafness. When told that his child had adenoids, he said, "Oh, if it is adenoids I can remove them myself." And so he did, but, when the deafness increased, my friend was consulted again, and on examination, under ether, found that both Eustachian cartilages had been torn out, leaving a permanent atresia of both Eustachian tubes which meant permanent deafness to the child. So I might go on, but time permits the mention of only the essentials.

One of the functions of the family doctor is to do his part in directing the care of the children of his clientel in such a way that they will grow up to be vigorous, healthy children with as good looking physical form and as well developed mental powers as nature intended for them and that they might be useful members of society and a help rather than a burden to the world; and there is no condition or diathesis or disease which can abort the good, distort the beautiful, and prostitute the useful like neglect of the adenoid condition. There is probably no condition of childhood which plays so important a part in the causation of febrile conditions, aside from the exanthemata. Many of the obscure and otherwise unexplainable attacks of febrile conditions in children up to eight years of age are due to acute inflammation of the adenoid tissue. I think it is safe to say that all earaches occurring in children under ten years of age, and the periodical earaches which occur in the night keeping the child awake for

several hours, then subsiding for several hours, and perhaps days, but repeatedly recurring, are due to temporary closure of the Eustachian tube which results from adenoid congestion following some slight exposure. The intermittent attacks of deafness which accompany a cold in the head are due to milder degrees of the same condition. Nervousness, peevishness, and all sorts of nervous phenomena and lowered vitality generally can often be traced to this diseased condition of the lymphatic glandular system of which the adenoid area is the seat of infection. So, if the family doctor would be well equipped to cope with the diseases of children, he must be well acquainted with the adenoid condition which plays so important a part in the list of predisposing causes of these diseases.

It is not my purpose in this paper to go into the symptomatology of this adenoid condition, for the books will supply this information better than I can, and you are all, doubtless, already familiar with the common symptoms. Aside from the complaints and symptoms which are so common and mark with monotony the vast majority of cases, there are occasionally subjective manifestations of peculiar interest and also prominent objective symptoms which help in making diagnosis without resorting to the shocking and disgusting method of digital examination of the nasopharynx which becomes a lasting horror to the child and causes it to dread the presence of the doctor.

I do not wish to burden this paper with statistics, so I will use as few as possible, confining myself to what seem the essential ones which have real value. These one thousand cases were about equally divided among the two sexes, there being 503 male and 497 female. The age limit ranged from six months to 31 years. The largest number at any one age was 64 at eight years of age. Dividing the age limit into periods of seven years each, about thirty per cent were during the first seven years; 50 per cent during the second seven years, and 20 per cent during the third period of seven years, there being only 28 cases over 21 years of age; 11 of these being thirty years old. In 905 cases, or about 90 per cent, the adenoids were associated with hypertrophy of the faucial tonsil, some with but a slight degree of hypertrophy, and others enormously enlarged. In these cases there was also more or less hypertrophy of the whole pharyngeal lymphoid ring. The

remaining 95 cases had the hyperplasia of the nasopharyngeal adenoids alone.

ETIOLOGY.

Investigation as to the cause of the trouble did not lead to very satisfactory results. Five cases were assigned to attacks of diphtheria, five to whooping cough, seven to measles, five to scarlet fever, one to mumps, and while the diseases of childhood undoubtedly help in the causation of this hyperplastic lymphoid condition, the data are so incomplete and negative, and so many children have enormous growths who never had any of the exanthemata that their importance in the etiology of the growth is not so great.

I have looked up the matter of climate, residence in city and country, infant feeding both by bottle or the breast, sleeping in cold or hot rooms, the relation of inherited tendencies like tuberculosis, syphilis, rheumatism and uric acid diathesis, but I do not see that any of these have a specific bearing on the subject although they may in any one or more, have their influence and doubtless do. So my only answer, imperfect as it may be, is that adenoid condition is an excessive activity of the lymphoid tissue of the pharynx, at first normal, stimulated by constant irritation from particles of dust or secretions with mild infection; the rapidity and development of the growth being governed by the atmospheric, climatic and constitutional conditions of the patient and personal hygiene.

SYMPTOMS.

1. *Subjective*.—The evidence of trouble as described by the parents of young children, or by the older ones themselves, are numerous, but the more frequent are, repeated colds in the head, difficult breathing, mouth breathing, snoring, cough, croup, hoarseness, tonsillitis, asthma, thick speech, inability to blow the nose, discharge from the nose, periodical earache, intermittent spells of deafness, intermittent or purulent discharge from the ears, nervousness, restlessness, especially at night, mental dullness, headache, epileptic seizures, night sweats, frequent feverish conditions, often quite a high fever, periods of malaise, and attacks of nausea, gagging, and vomiting, which are often attributed to digestive disturbances.

2. *Objective*.—Face—Deformed face and more or less typical adenoid expression.

Mouth—Hard palate high arched, teeth are irregular.

Nose—Improperly developed both outside and inside.

The nasal fossae showed deviated septum with ridges, erectile turgescence of the turbinals, turgescient spot on the floor of the nose; I would not say hypertrophy of the mucous membrane, for I am doubtful if organized hypertrophic tissue exists in very young children.

Ears—Dullness of the drumheads, light spot absent or only faintly visible. Chronic suppurative otitis media with more or less destruction of the drumhead. Serous otitis media and acute otitis media.

Neck—Glands larger than normal and sometimes greatly enlarged, although on the whole the lymphatics of the neck, axilla and groin were not much changed. For a time I examined these regions carefully while the patients were under ether.

Chest—Deformed chests and chicken breasts are not as frequent as might be supposed.

Throat—Thickened and sometimes nodulated faucial pillars and uvula, enlarged tonsils, enlarged follicles on the posterior and lateral walls.

Voice—Deadened, with lack of nasal resonance and frequently hoarseness.

DIAGNOSIS.

Diagnosis is easy in typical cases which show the facial expression and the effects of mouth breathing which are easily recognized by every one. About 50 per cent of the adenoid cases are mouth breathers, the remainder have little or no difficulty in breathing except perhaps when the patient has a cold; but in these cases either the ear symptoms are prominent or the effects of the growth on the general health are evident. Other important indications showing the presence of adenoid growths are the intermittent attacks of deafness and earache in children. Whenever these conditions are present we may be quite sure that adenoids are responsible for the mischief, as nothing else would cause it. The appearance of the drumhead is an important help in diagnosis, as in almost all cases where the ears have been affected at all, and even in a large number of cases where there have been no ear symptoms, the drumheads are dull and the light spot is absent or only faintly visible. The chronic suppurating ears of child-

hood, which are not dated to an attack of scarlet fever or measles, are always suggestive of adenoids, and in such cases the chance of curing the discharging ear without the removal of the adenoids is very small. Probably fifty per cent of all inflammatory diseases of the tympanum are due to adenoids.

Another helpful sign in diagnosis, where neither breathing nor ear symptoms are prominent, is a small area of swollen mucous membrane on the floor of the nose about on a line with the anterior end of the inferior turbinal. My attention was called to this about ten years ago by Dr. Lennox-Browne, of London, who said that to him it was always a positive indication of the presence of adenoids; and in my experience this has proven an unfailing sign when present.

The presence of hypertrophied faucial tonsils is always an indication of the presence of adenoids. For more than ten years I have not used my finger in determining the presence of adenoids, as it is unnecessary and it is not always reliable. The contraction of the superior constrictor muscle of the pharynx grasps the finger and it is impossible to determine whether you are feeling an adenoid mass, muscle or other soft tissue. On the other hand, the deep recess which is so often present just above the tubercle of the atlas may contain an enormous amount of adenoid tissue which the examining finger may not touch at all. It is a horror to the little patients to have the throat examined in this way, and when we can easily make a diagnosis by other means I do not think we should subject our little patients to such a barbarism.

The rhinoscopic mirror is frequently useful as an instrument in verifying a diagnosis and it can be used easily in the majority of cases.

THE PREPARATION OF THE PATIENT.

The preparation of the patient in a general way is the same as for any surgical operation. The alimentary canal should be as empty as possible and an absolutely empty stomach is best. Milk and solids should be avoided for at least six hours. If diphtheria is in the neighborhood or schools, cultures should be taken from the nose and throat to see that there is no possibility of diphtheria bacillus being present. The patient must be free from acute inflammation of the nose and throat or air passages, and purulent disease of the nasal accessory sinuses;

and if any of the family have ozena or purulent inflammation, they must be kept away from the patient after the operation until healing is complete. It is not wise to operate within a week or ten days after an attack of acute tonsillitis, or several months after syphilitic inflammation. Purulent disease of the teeth and alveoli should also be carefully considered.

These general conditions being observed, the coast is clear for operation, and the patient's head is covered with a towel or rubber cap securely fastened and all is ready for the anes-

ANESTHETIC.

All but two cases of this series were operated on under ether anesthesia. A few cases were started with nitrous oxide gas but on the whole I think clear ether is better, as the adenoid cases always require more ether than others and it is necessary to have the system saturated with it before beginning the operation. Then, too, I think nitrous oxide congests the vessels of the head and increases the bleeding. It is very necessary to have the throat perfectly relaxed, as any gagging and contraction interfere with the clear and easy removal of the growth and endanger the continuity of the soft parts of the pharynx. It is very important that relaxation is complete for the removal of the tonsils, as any interference here renders a safe and satisfactory removal of these glands impossible. Anesthesia must not, however, be carried to the profound stage, as we need the laryngeal reflex to protect the air passages against the invasion of blood clots. The absence of the eye-lash reflex is not a sufficient indication of the complete anesthesia, as the pharynx remains active some minutes after the eye-lash reflex is gone. I would discourage the use of the cornea reflex, as I have seen eyes most unmercifully poked by the anesthetist's finger.

If we could know just what condition existed before anesthesia, nitrous oxid or chlorid of ethyl or somnoform would be ideal anesthetics, but while some cases require only two or three minutes, the majority require ten minutes and sometimes longer to do a clean operation, and in one case recently it was thirty minutes before I could get the throat clean, the growth being spread about so diffusely and the patient was taking ether poorly. But I always like to find that I have plenty of time even if I do not need to use it.

Chloroform is especially dangerous in adenoid cases, as they belong to that class of cases known as the *habitus lymphaticus* in which chloroform is contraindicated, and in which most deaths from chloroform narcosis have occurred. Twenty deaths from chloroform in adenoid and tonsil operations have been reported since 1890, and I know of one case in Providence which could be added to the list. Knowing this, I do not think we are justified in taking the risk. In one of my cases the family physician, who was to anesthetize, was very anxious to give chloroform and when I refused to operate under such conditions, he wished to know my reasons, and after I had given them he said that he had had a large experience in the use of chloroform anesthesia and he remembered alarming symptoms in adenoid cases and what he considered narrow escapes from death, but he thought it was simply a coincidence and not that it was an adenoid idiosyncrasy.

The two cases operated on without anesthesia were, one a boy of five years who had been a "blue baby," and had a bad heart; and the other a youth of fourteen who wanted it done without ether. The former fortunately had a growth suitable for a quick operation; the latter was done at two sittings. I have seen many "adenoid scrapes" in the Vienna clinics and the various clinics in Germany, but our people would not stand for such operations, and I do not believe they are thorough. In England I have seen many operations done with nitrous oxide gas which seemed more suitable than the continental method, but they are necessarily hurried, and in some cases could not have been complete.

POSITION OF THE BODY.

My first operations were performed with the patients in an upright position held in a chair by the assistant, but the difficulty of always securing the proper assistants who could hold the patient well, and the special difficulty of handling the larger patients and the possible danger of the blood clots or particles of growth getting into the larynx, led me to try a position which I had never seen or heard of before, but which seemed to answer all the requirements of safety and convenience and in which any one could hold the patient, and after thirteen years of constant use I see no reason to change.

After anesthesia is complete the patient is turned on the right side resting on the right shoulder with both shoulders in a perpendicular line: the right hand pulled back out of the way so the patient can be easily turned forward in case of vomiting, or to allow the blood to flow out of the mouth and nose. The head is allowed to hang loosely towards the table or rest upon it. This allows the blood to flow freely, leaving the throat free from accumulation of clots, as is always the case in the position where the head is hanging over the head of the table. The table must be placed in such a position as to allow the patient to face a window with good light exposure. My own position while operating is parallel with the upper part of the patient's body as nearly as possible, which gives practically the same relationship as when the upright position is used. It is best to have a fairly high table, which can be made in any house with a kitchen or laundry table with the small section of a mattress placed upon it.

INSTRUMENTS AND TECHNIC.

Among the instruments a good mouth gag is very essential, one that is self-retaining, will not slip and does not press on the jaw in a way that interferes with the breathing. For many years I have used the O'Dwyer Gag, which, while not answering all these requirements, was the best to be had. The Jansen Gag, with some few alterations which I have made, seems to answer these demands, and is a helpful instrument. A simple palate retractor which protects the palate as well as enlarges the space for operation, so that the growth may be partly seen; forceps after the Hooper pattern, but a little larger, also Lowenberg's and other patterns to fit the peculiarities of individual cases, for no one instrument is suitable for all cases. I lately devised a forceps which suits my fancy better than any one of the others, and being made in four sizes is applicable to a greater variety of throats.

After the palate retractor is placed in position the forceps are introduced and closed on the growth, then the palate retractor is removed, and holding the grip of the forceps in the left hand, the fore-finger of the right hand is slid along the blade and the tissue which has been grasped by the forceps is separated from the pharyngeal wall by a to and fro motion of the index finger of the right hand. This avoids any unneces-

sary laceration of the mucous membranes and protects the muscle and fascia from injury, and if other parts are accidentally included it is very easy to release the forceps and make a new application of them. This process is repeated until all the redundant growth is removed. For reaching behind the Eustachian tubes in the fossa of Rosenmueller, the narrow bladed forceps are used and what is left is scraped with the finger nail of the index finger of the right hand which is kept in readiness for just such purposes. After all is removed the area is smoothed up with the finger nail and the curette is rarely used. The Gruber curette is, to my mind, the best of all. If the curette is used we must always bear in mind the possibility of wounding the tip of the tubercle of the atlas, which protrudes very prominently into the throat in a large percentage of cases. Let the curette be carelessly or forcibly drawn over this tubercle and it would be an easy matter to remove all of the soft tissue to the bone.

The tonsils are always left until the last unless they are very large and obstruct the way. These are removed by the guillotine.

For several years I used the Matthieu Tonsillotome but found it an unsatisfactory instrument for tonsils which were submerged or which did not project beyond the faucial pillars, and even in very large tonsils it is impossible to do more than cut them to a level with the pillars. For the past ten years I have used the Baginsky Tonsillotome, which is a guillotine model with a ring grip. These are made in three sizes, the openings which engage the tonsil being three-fourths, seven-eighths, and one inch in diameter. The smallest size is the most useful for the deep tonsils, and I have had a special size made one-half inch in diameter which is invaluable for removing the tissue deep in the tonsil bed and in the supra-tonsillar fossa. This instrument is simple in its construction; it may be used on either side, quickly changing from one side to the other and easily cleaned, with nothing to break or get out of order. Using the different sizes, I have been able to remove as much tissue as seemed necessary in any given case. The small size is always used to clean out the supra-tonsillar fossa and other prolongations, giving a normal appearing throat in most cases after it is healed. It is often, perhaps always, necessary to make several applica-

tions of the tonsillatome in order to make a thorough removal. When the throat is thoroughly relaxed, the tonsil can be pulped, as it were, into the opening of the instrument and a piece removed at each application until one is satisfied that the fossa is clean. Here again is where many operations fail to improve or give relief to ear conditions. The supra-tonsillar fossa must be thoroughly cleared of tonsillar tissue.

I have made some use of the tonsil punch, but I can do better in most cases with a small guillotine. I have used the snare but very little; it leaves a sore throat for a longer time than the guillotine. It is too slow for me, and the question of hemorrhage, which I suppose is its chief end, is not eradicated, as cases of serious hemorrhage have been reported after its use.

Immediately after every operation, as a safeguard, I make an application of glycerite of tannin to the denuded area of the pharynx and fauces.

Other conditions operated on at the time of the adenoid operation were nasal polypi, one case; fibroma, one; deviated septum, six; ridge of septum, four; posterior turbinal hypertrophies, two; caries of the tympanum, three; carious ossicles, twenty-six; incision of drumhead for acute otitis media, five; mastoid abscess, two; phimosis, six cases.

thetic.

AFTER-TREATMENT.

After-treatment may be divided into two periods, the immediate and the future. After the patient has recovered from the anesthetic and nausea and vomiting have ceased, cracked ice and cold water are allowed. A little later cold milk and an article of food, which pleases most children, ice cream. Hot drinks and hot food are avoided, as they encourage bleeding while the cold materials tend to prevent it. After the first twenty-four hours the usual diet is allowed. The patient is kept in a moderately warm room night and day for two or three days, the temperature being kept at 65 to 70 degrees. The patient is kept in bed for twenty-four hours, and in the house at an even temperature as nearly as possible for three or four days according to the time of the year and the condition of the weather.

The patient is seen in ten days or two weeks, by which time the throat is about healed. The future treatment is sometimes

necessary, as the lowered vitality and the lymphatic habit tends to make complete results slow. Then, too, the local conditions must be looked after. It is very necessary to see that the ears resume their function naturally; that discharging ears cease, otherwise permanent deafness and serious trouble may result. The engorged condition of the turbinals must be corrected as quickly as possible in order to establish nasal breathing. This usually corrects itself in a few weeks after the operation; but the parent should be instructed that if mouth breathing continues after one or two months, the patient should be examined. This condition of persistent mouth breathing is often attributed to recurrence, but it is more often due to the engorged condition of the turbinals which is so common when adenoids are present and which often persist for a long time after they are removed.

The good results of an operation are not always immediately realized; sometimes several months are required before nasal breathing is fully established. It frequently happens that the parent will complain that the child is no better, or breathes with his mouth open, and is just the same as before the operation. This may happen a year or two after an operation, and they think, or they have been advised, that the growth has recurred; a few applications to the nasal mucous membranes will restore nasal breathing unless there has been some bony or cartilaginous obstruction left in the nasal fossa. It is very true that many breathe through the mouth after operation for a long time, but this is readily accounted for by habit. The muscles of the jaw which have been relaxed so long do not always readily resume a normal condition; but if the parent is persistent in correcting the child this habit will soon be overcome. In some cases, however, it may be necessary for a time at least to hold up the jaw with a piece of tape.

COMPLICATIONS.

Hemorrhage.—The adenoid and tonsil operation is necessarily a very bloody operation, but I have been especially favored in not having any serious hemorrhage in these one thousand cases. There were no cases of serious primary hemorrhage, but one case had an alarming secondary hemorrhage five days after the removal of one tonsil in an adult patient, but this was checked with ice and glycerite of tannin.

Infection.—It would seem that a large open wound would become infected while healing, but I have had but two cases which have shown any disturbing symptoms of infection. These were both in the same family, occurring a year or more apart. The mother of these children had ozena.

Earaches.—Some have reported earaches as frequently following the operation, but I have not had any which were due to the operation, although I have had three cases which had an acute inflammation of the ear three or four days after the operation which could be readily accounted for by exposure immediately after the operation.

I believe that all acute middle ears in children are due to adenoids, barring the otitis complications of the exanthemata, and I think that these are often caused by the growth. I have many times removed adenoids while the child has had acute middle ear trouble and have, I believe, prevented serious trouble with the ears. And twice in a mastoid inflammation I have removed adenoids and tonsils and I am sure that the depletion and freeing of the Eustachian tube saved the mastoid operation. It might be considered unsafe to make such a large exposed surface in the presence of the purulent disease in the ear, but I have removed adenoids in thirty-six cases of middle ear inflammation and have had no infection.

RESULTS.

The effect of the operation on the general health is, in nearly every case, very pronounced and in some cases truly marvelous. Nature seems delighted to be rid of this offending material. It seems as though a heavy weight had been removed from the child's body, as though a life that had been in bondage has been set free. The pale, sickly, poorly-nourished children begin to grow in all directions, their bodies show better nourishment, the once flabby flesh becomes firmer, the skin shows a better color, the stupid, vacant facial expression gradually disappears and a more normal physiognomy is established; and in the deformed faces of mouth breathers, if the condition has not existed too long, there is a decided change for the better as soon as the nasal breathing is established. In the children under twelve where the ears have been involved, there is usually a restoration of the hearing function. In some cases, however, after-treatment of the ears is necessary. In the suppurating ears, if there is no diseased bone, the otorrhea

ceases in a short time. The whole scene, in fact, is changed; the nervous, irritable, peevish disposition soon fades away and the child seems like a new being. The night scene is a decidedly changed one, the restless tossing about in bed, the snoring and struggling for air is replaced by peaceful, quiet sleep. All things considered, there is no medical or surgical transaction which will call forth more expression of gratitude and praise for the physician than this operation when successfully performed.

RECURRENCE.

I was called upon to operate the second time on two of my cases because other specialists had said the growth had recurred after my first operation, and the parents wanted another. In the first case, two years after the first operation, I found a piece about the size of a pea in the vault of the pharynx, otherwise the throat was smooth and clean. In the second case, which was in a doctor's family, one year after the first operation, the throat was found entirely free from growth and in a perfect condition. One case which was operated upon the first time at the age of 6 months, was again operated upon at 4 years old, and a typical growth of adenoids and tonsils was present. I have seen three cases where the tonsils, which were not completely removed, increased in size within two or three years after operation. Aside from these examples I do not know of any cases of recurrence in my cases. I have operated 15 times on cases previously done by others and in every case showed that the first operation was not well done and the growth which had been left had continued to grow so that the symptoms had only been temporarily relieved. Five cases were the result of the finger-nail operation in which the mass had been simply lacerated. In these cases the growth was as large, seemingly, as though it had never been touched and in much worse condition on account of the mesh of cicatricial bands resulting from the tearing of the growth with the finger-nail. In one case of forceps operation the fascia and muscle tissue had been torn from the posterior lateral wall of the pharynx leaving a bad deformity, but the adenoids were left in the vault of the nasopharynx and the tonsils only partly removed. One can see how in so-called scrofulous children, or in children operated before the normal development of

adenoids is complete, as under a year or so of age, it might be possible for a new growth. Yet if all redundant lymphoid tissue is carefully removed, I believe recurrence to be an extremely rare condition.

ABSTRACTS FROM CURRENT OTOLOGIC, RHINOLOGIC AND LARYNGOLOGIC LITERATURE.

I.—EAR.

The Theory of Sound-Conduction.

BOENNINGHAUS, Breslau (*Archives of Otology*, Vol. XXXV., No. 5). According to the author, the point about which the entire theory of sound-conduction rotates, is the question whether the vibrations of the basilar fibres, which according to Helmholtz's theory, are regarded as the adequate irritants of the auditory nerve terminals, are set in motion by the movements of the water column in the labyrinth in a mechanical manner—mass movement—or by means of molecular waves which traverse the labyrinth water and by addition of this molecular impulse are set in vibration just as tense strings co-vibrate—molecular movement.

His view that the basilar fibres are caused to vibrate by molecular motion rests upon the fact that the labyrinth of the whale, this water animal which constantly swims with its ear under water, hears everything well which occurs in the water about it when it is acted upon by the molecular movement. The reason for this is that the stapes of the whale is so firmly fixed in the oval window that the necessary force which would be required to make it move in the direction of the labyrinth cavity is inconceivable. The stapes is consequently physiologically immobile.

Campbell.

The Nature of Otosclerosis In the Light of Heredity.

KOERNER, Rostock (*Archives of Otology*, Vol. XXXV., No. 5). It is well recognized that progressive deafness occurs in several successive generations of a family.

Children inherit or the parents transmit only those peculiarities which are contained as rudiments in the germ plasma of the parental sexual cells. The union of the ovum and the sperm cell completes the act of inheritance. The inherent material substrata of the parental germ cells are called determinants. The unusual number of determinants do not alone

originate in the plasma of the parents, but from the collected ancestral plasma. They may be transmitted from one individual to progeny without ever having become active in that individual.

Otosclerosis is that form of progressive deafness which pathologically rests upon a hyperostotic new formation of bone in the labyrinth windows, thus fixing the stapes in the oval window and the rarefaction of the otherwise compact labyrinth capsule. Siebenmann claims that this is an abnormal hereditary post-embryonal development, in which the greatest incentive to bony growth is the onset of puberty and the childbed.

Cases in which one can not trace hereditary influence are probably those of latent inheritance. Grandchildren frequently resemble their grandparents more than they do their parents and as in twelve generations we have 4,096 forefathers it would be difficult to trace their determinants as most ancestral trees can be followed to scarcely three generations.

The only prophylaxis is to urge those who are suffering from otosclerosis not to marry, that they may carry their determinants to the grave.

Campbell.

Disturbances of the Sense of Taste in Chronic Suppurative Middle Ear Conditions, Particularly After Operations.

LUDWIG KANDER (*Archiv für Ohrenheilkunde*, B. 68, H. 1 and 2, 1906), first discusses the chorda tympani and its importance as a nerve of taste. The first author who mentioned the chorda tympani as a possible nerve of taste was Bellingeri. He went too far, however, because he considered the chorda the only nerve of taste. Claude Bernard's investigations threw more light on the subject. In a case of paralysis of the left side of the face, due to injury to the temporal bone, he found in the anterior part of the left half of the tongue, a diminution of the sense of taste, particularly for acids. He considered the chorda a motor nerve, with the function of stimulating the taste papillæ.

Lincke reports a case in which a paralysis of the facial nerve in its course through the Fallopian canal was positively diagnosed by the loss of taste of the corresponding side of the tongue.

The question as to where the fibres of the chorda tympani

originate has not been positively settled in spite of the many experiments. The most reasonable explanation seems to be that the chorda fibres take their origin in the trigeminus.

The author reports the following case of disturbance in the sense of taste originating intracranially, which appears to prove this theory:

A man, aged 43 years, acquired lues in 1885, which was not properly treated. Since 1887 he noticed a loss of sensation of the right half of the face. He presented himself for ear treatment in 1903. The whole right half of the face was found anesthetic, as well as the mucous membrane in the right nostril and right side of the mouth, with the exception of the base of the tongue and soft palate. The facial nerve was not involved. Hearing normal. Mastication was more difficult on the right than the left side. There was an entire absence of the sense of taste in the anterior two-thirds of the right half of the tongue. On all other parts of the tongue, soft palate, arch of the palate, and posterior wall of the pharynx, an acid was tasted at once.

So that this is a case of cerebral affection (lues), with complete right sided paralysis of the trigeminus, combined with absence of the sense of taste in the region of the end distribution of the chorda tympani.

The author made investigations of the sense of taste in 50 cases of chronic suppurative otitis media and cholesteatoma, in the Freiburg Ear Clinic. Also in cases in which operations had been performed for the middle ear condition. He wished to determine whether testing the sense of taste would indicate the relative severity of the middle ear disease.

He found in the cases in which the chorda tympani was destroyed, and in which there was an absence of the sense of taste of the anterior two-thirds of the corresponding half of the tongue, that there was a severe destructive process in the middle ear, either an extensive caries of the bone or cholesteatoma.

The experiments also proved that in every case in which the ossicles had been extracted or radical operations had been performed, the chorda tympani had been destroyed.

The plexus tympanicus which supplies the posterior third of the tongue, the soft palate, the arch of the palate, and the posterior pharyngeal wall with taste fibres, has a protected situation, and although it may be injured during curettage of

the tympanic cavity; as a matter of fact in the majority of the cases this does not occur.

A complete loss of the sense of taste in the regions supplied by the plexus, would prove that it had been completely destroyed during the operation. A chronic purulent process may in time involve the plexus.

In conclusion, the author states that a complete destruction of the chorda tympani and tympanic plexus shows itself in a complete loss of the sense of taste; that the chorda tympani may be involved in chronic suppurative middle ear processes; that the radical operation always destroys the chorda tympani, and that disturbances of the sense of taste, following this operation, are permanent and incurable.

That the chorda tympani and tympanic plexus are pure nerves of taste.

Theisen.

On Objective Tinnitus.

FRIEDMAN (*Archives of Otolaryngology*, Vol. XXXV, No. 4). A girl aged 9 has complained of peculiar noises in both ears for several weeks. These rhythmic crepitant sounds are also heard by the observer on placing the ear near that part of the child. Their frequency is 100-120 per minute and they are not synchronous with the pulse. There are no movements to be observed in the drum. Occasionally contraction of the soft palate synchronous with the noise can be observed. The convulsions in the muscles of the lower jaw appear also to be synchronous with the noise. Hearing is normal.

The diagnosis was made of a chronic spasm of the tensor veli muscle on both sides.

It was formerly believed that all these noises depended upon a contraction of the tensor tympani muscle until Politzer in 1862 showed that this peculiar crepitation could be produced by a separation of the anterior from the posterior wall of the tube. He also observed a synchronous associated movement of the soft palate.

In most of the cases reported the patients have been nervous after a general illness or one of the ear. In the case reported the child had suffered from appendicitis and had been ill for 29 weeks. This was followed by a paralysis of the lower extremities, apparently due to a spinal meningitis, with gradual, complete recovery.

Campbell.

The Treatment of Purulent Otitis By Congestive Hyperemia.

KEPPLER, Bonn (*Archives of Otology*, Vol. XXXV, No. 4). The author gives a detailed account of twenty cases, 10 of which were acute and 10 chronic, treated by Bier's method. As in the case of the extremities, the more acute the inflammation the more successful the treatment. Of the cases of acute mastoiditis every one was cured; in some a paracentesis was done; in some, where fluctuation was elicited over the mastoid, a miniature Wilde's incision was made.

The treatment of chronic cases of congestive treatment was less favorable. If dead bone has already been sequestered or cholesteatoma is present, nothing can be accomplished by this method. Of seven cases only two were cured, the one being a relapsing mastoiditis subsequent to operation, the other a chronic purulent otitis with formation of a polyp in which after removal of the polyp a cure speedily took place.

Campbell.

The Advisability of Eliminating the Terms Meniere's Diseases and Meniere's Symptoms from Otologic Nomenclature.

EMIL AMBERG, Detroit, Mich. (*American Journal of the Medical Sciences*, July, 1906). Conclusions:

1. The triad: Hardness of hearing, vertigo, and tinnitus is given as constituting the functional disturbance observed in the so-called Meniere's disease.

2. These symptoms occur also in numerous affections which are not based on the pathological finding as described by Meniere in his historical case.

3. The observation that not always a typical picture is present has led to the introduction of other terms, such as "Meniere's symptoms," etc., which has proved to be confusing.

4. Even affections of the middle ear, of the outer ear, or of other parts of the body can cause the symptoms described by Meniere.

5. These latter causes can be diagnosed in many instances and prove the existence of a great group of affections characterized by functional disturbances of the inner ear.

6. By abandoning the terms "Meniere's disease" and "Meniere's symptoms" a more definite nomenclature can be introduced. This is important not only from a physiologic and pathologic, but also from a clinical standpoint. By

using, for instance, the terms "otitis interna syphilitica," or "leukemica," or "angioneurotica," or "gastrica," a clearer conception of some affections would ensue.

7. The various terms should be agreed upon. The many international medical meetings give ample opportunity for such a procedure.
Richards.

A Contribution to the Etiology of Otitis Media Acuta Suppurativa Post Morbillos.

GUSTAV BAAR, Portland, Oregon (*Medical Record*, August 18, 1906). Five cases of otitis media suppurativa following measles, all occurring in the same family, are reported, in three of which cases the mastoid process, the antrum and the cranial cavity respectively had to be opened on account of alarming cerebral symptoms. The purulent inflammation of the middle ear occurred at about the end of the second week of the illness, which the author thinks seems to speak very much against the universal view, according to which the measles otitides are caused by the primary exanthema. Bacteriologic examination in all the cases under aseptic precautions showed that the pus taken from the depth of the external auditory meatus as well as the pus taken under aseptic precautions during the operation from the antrum, mastoid process, and extradural abscesses, contained the same coccus, a staphylococcus, which was the cause of the disease.

Richards.

A Simple Method of Finding an Easily Accessible Portion of the Lateral Sinus.

EMIL AMBERG, Detroit, Mich. (*Journal of the American Medical Association*, May 19, 1906). This will be found by bisecting the angles formed by the linea temporalis and the anterior border of the mastoid process, and projecting the bisecting line backwards.

Richards.

Lumbar Puncture.

S. J. KOPETZKY, New York (*American Journal of the Medical Sciences*, April, 1906). This is a general review of its value and applicability with a careful resume of the published literature.

Medullary anesthesia is on the wane. Lumbar puncture as a therapeutic measure in the management of ear affections is recommended by Babinski, but it is doubtful if the test of time will prove the method to be of any great value for this class of cases.

As a diagnostic measure the advantages of conclusive results are offset by the delay in the appearance of the culture growths, as two or three weeks are necessary, and this prevents the practical application of culture methods for diagnostic purposes in the majority of intracranial complications of middle ear disease.

The reader is referred to the original article for further details.

Richards.

The Odor as a Guide In the Treatment of Chronic Suppuration of the Middle Ear.

H. GRADLE, Chicago (*Journal of the American Medical Association*, November 24, 1906), regards the odor as a test of the efficacy of conservative treatment. Most cases of chronic suppuration are accompanied by foul odor due to the anaerobic bacillus. Decomposition of the discharge is an important factor in prolonging the disease. When freely accessible the source of suppuration is readily dislodged, which is not the case when there are sinuses or fistulas or spots protected by granulations, and it is in these later class of cases and in the presence of caries, necrosis or cholesteatoma where radical operation is more likely to be needed. He uses irrigation and gauze drainage with various local measures, such as nitrate of silver, tannin in glycerin, boric acid, alcohol and ether, followed by carbolated glycerin. When syringing and local application of these measures fail, he uses drainage by gauze tampon, but finds that this does not remove the odor directly, from three to six weeks being required until the gauze remains dry. He found gauze drainage to end in a complete cure in about 50 per cent of the cases, partial cure in 33 1-3 per cent, and failure in 16 per cent. By partial cure he means those instances in which gauze drainage removed the odor in the course of a few weeks, but failed to end the suppurative process completely. Such patients, when treatment is discontinued, do not get subjectively worse but the discharge increases slightly and may again become fetid when neglected. He has not known such cases to suffer from any consequences

or aggravations. He is, therefore, reluctant to urge a radical operation in these cases of partial success, as it is his experience that when the odor is permanently removed in chronic suppuration, the disease has lost its progressive and hence dangerous character. The patient has therefore to choose between the danger of a radical operation and the necessity of more or less prolonged treatment. *Richards.*

Teaching the Deaf Child to Hear.

HUDSON-MAKUEN (*N. Y. Medical Journal*, March 17, 1906). Writer after reporting a case and referring to the work of Natier and Urbantschitsch, concludes:

First.—The hearing of the deaf child may be greatly improved by the systematic use of oral gymnastics.

Second.—The speaking voice used in close approximation to the ear, is the most effective form of oral gymnastics in children.

Third.—The training of speech should be carried on simultaneously with the hearing exercises.

Fourth.—The degree of success attained will depend largely upon the patience and skill of the teacher. *Harris.*

The Early and Preventive Treatment of Acute Otitis Media.

WILKINSON (*N. Y. Medical Journal*, March 17, 1906). Attention is called to the fact brought out by Kerley that acute otitis media in children is often not associated with pain, but that fever is always present. In addition to the usual treatment of rest, aconite, calomel and local applications that tend to relieve pain and inflammation, Wilkinson advises when seen the employment of inflation by Politzer's method and of leeches. *Harris.*

A Case of Aneurism of the Middle Ear With Intact Drumhead.

SPENCER (*N. Y. Medical Journal*, March 17, 1906). A woman of 22 consulted him for a pulsation in the ear combined with deafness existing for three months. Examination of the ear showed a marked bulging of the membrane which seemed to merge with the lower canal wall. This was of a dark red color. There was no pain. The bone conduction was lengthened. A diagnosis of fluid in the middle ear was made. The usual

incision was followed by profuse hemorrhage, which was controlled by packing. The hemorrhage recurred upon the removal of the packing but was easily checked by the gauze, till in the course of a few days it ceased to occur and the incision closed over. The patient was under treatment for some time but made no improvement as regards the tinnitus. From the history of the case and the appearance of the drum-membrane Spencer thinks he could be dealing only with an aneurism of the middle ear.

Harris.

Technic of the Radical Tympano-Mastoid Operation When Complicated By the Anterior Position of the Sigmoid Sinus.

BRYANT (*N. Y. Medical Journal*, April 14, 1906), in connection with the report of two cases, draws the following conclusions:

1. The extreme anterior position of the sinus is no obstacle to a complete radical operation.
2. The front bent gouge is the safest and handiest instrument for the bone carving necessary in otologic surgery.
3. Avoidance of packing in the excavated middle ear cavity results in a minimum of deformity and scar. It hastens convalescences and epidermization, by lessening the cavity, which must fill up and area must finally epidermatize.
4. My modified blood clot hastens the convalescence considerably.
5. The possibility of having an infected wound is no contraindication to this modified blood clot method.
6. Exposure of the dura mater does not contraindicate the modified blood clot method.
7. It is not necessary to suture the posterior wound in order to secure a perfect result.

Harris

Technic in the After-Care of the Radical Mastoid Operation.

PHILIP HAMMOND, Boston, Mass. (*Journal of the American Medical Association*, November 17, 1906). This article relates almost entirely to skin grafting, which is done by the writer through the external canal seven days after the primary operation, with the graft preferably 2x3 inches, cut very thin, and applied very carefully to the denuded bone, which by this time has a few granulations. These granulations must be carefully dried before applying the graft. A

very sharp knife is essential for the cutting of the graft. After lightly packing the graft into position, the wound is not disturbed for three days. There will be more or less purulent discharge from the sloughing of the redundant folds of the graft, but at the end of two weeks a firm layer of new skin will be visible nearly if not quite all over the cavity, and suppuration will have ceased.

One of the essentials of the technic is the introduction of the graft itself, which is placed on a cone of gauze, the apex of which will just fit into the middle ear and antrum. By this means the graft is carried clear down to the deepest portion of the antral cavity.

Richards.

An Aseptic Protective Sheet for Mastoid Surgery.

H. O. REIK, Baltimore, Md. (*Journal of the American Medical Association*, November 17, 1906). To avoid the necessity of cutting away a great deal of hair, especially in female patients, the author has devised a heavy rubber sheet 30x30 in., with a thin rubber insert 7x7 cm. After preparing the mastoid region in the usual way, a coating of Para rubber solution is applied to the skin and the protective sheet laid on and smoothed down in the proper position. It adheres to the skin very quickly. The thin insert is removed and a new one attached for each case, but the larger sheet can be repeatedly sterilized by boiling. The skin cut is made directly through the thin rubber section.

Richards.

Postural Treatment of Otitis Media and Mastoiditis.

A. E. SCHMITT, New York (*American Journal of the Medical Sciences*, November, 1906). The author thinks that many cases of acute purulent inflammation of the middle ear would be saved from going on to mastoiditis with the resultant operation, provided they were treated with more regard to the anatomic relationship of the middle ear and antrum. After free incision of the tympanic membrane, made so as to produce a flap by incising first from the tip of the long process of the malleus downward and then posteriorly, beginning half way up and curving down, a second incision is made meeting the first, which gives a larger opening than a single incision, permits free drainage, and is large enough for introducing a small canula for irrigating the middle ear.

The patient is then placed in a position in which the antrum is at a higher elevation than the middle ear, and the middle ear higher than the Eustachian tube. He lies face downward, the forehead and one cheek supported by pillows, the nose and mouth and one eye free. In this position perfect drainage can be secured. The patient assumes it not only from necessity but soon adopts it by preference as a comfortable posture during sleep. This permits of drainage either externally or through the Eustachian tube rather than by way of the antrum. He thinks by this method he has prevented many cases of otitis media from developing into operable mastoiditis. The region of the Eustachian tube is looked after most carefully during the treatment.

Richards.

Paralysis of the Facial Nerve Due to the Eustachian Electro-Bougie: Report of a Case.

JOHN B. SOLLEY, New York (*American Journal of the Medical Sciences*, November, 1906). In this instance while a small bougie was being passed through the left Eustachian tube, at the second sitting for this purpose, paralysis of the facial nerve appeared almost immediately after passing an obstruction. The paralysis was complete at first, gradually became better and disappeared entirely in about one month. The author thinks it was probably due to an anatomic defect which he has found to occur in a certain number of specimens studied. As the result on the hearing was very good, he does not regard this accident as a contraindication to the use of the Eustachian electro-bougie.

So far as known, his is the only case of this accident as yet reported.

Richards.

The Blood-Clot Method of Wound Repair In Aural Surgery.

SPRAGUE, F. B. (*The Laryngoscope*, September, 1906). The employment of the organized blood clot in the hearing of the mastoid wound is still an experimental procedure, although in general surgery it is recognized as a rational method of imitating nature and assisting her in wound repair.

There are two methods of using the blood clot: First, the closed method, using a superficial vent or not, according to circumstances; and second, the drain method, where a gauze wick drain a half inch or less in width, or a small Halsted protective drain is inserted a half inch or deeper into the cavity.

If the first method fails, the second can easily be resorted to by separating the incision with a probe and inserting a drain wick. In the most unfavorable cases where blood-clot healing is tried, healing is rarely longer than three weeks, so that if the blood-clot method should be a failure, three weeks have been gained, if measured by the duration of the old method, which required at least six weeks. One condition must be thought of in contemplating the use of the blood clot in the healing of the mastoid wound, and that is that at the bottom of the mastoid wound we have an anatomic space, the tympanum, which at the time the wound is made is pouring out infectious material which endangers the blood clot. The first point of attack should therefore be the tympanum, to rid it of as much septic material as possible. The author then describes the technic of the operation; the first step after rendering the field of operation thoroughly aseptic is to carefully cleanse the external auditory canal and tympanum.

The tympanic membrane should be freely incised from top to bottom, at the same time cutting deep enough to incise the engorged mucous membrane of the cavity. This should be irrigated and swabbed out with 60 per cent alcohol, after which the canal is plugged loosely with gauze.

In describing the technic of the mastoid operation itself, the author states that the periosteum should be elevated without injury, and replaced after the bone is evacuated. After the wound cavity is thoroughly cleaned out and irrigated with normal salt solution, it is mopped dry and allowed to fill with blood.

The periosteum is then replaced, and the soft parts brought together and sutured.

The author has operated upon 186 acute cases. In 129 of these one of the blood-clot methods was tried.

The other 57 were healed by granulation, most of these in less than four weeks. Sixty cases were treated by the drain method, healing in from 12 to 28 days. In 69 cases the typical blood-clot method was used, and 42 of them healed without interruption in from 7 to 15 days, as follows: One case in 7 days, 3 in 10 days, 2 in 11 days, 2 in 12 days, 4 in 13 days, 20 in 14 days, 10 in 15 days. Of the 69 cases, 11 had pus outside the bone, 10 had perforation of the outer cortex, 7 very extensive necrosis, and 4 had defects in the inner cortex.

The author has used the blood clot in the radical operation

in 16 cases, only two succeeding perfectly and 5 partially. Four became infected and the clot was entirely lost; 5 appeared to heal but broke down in from five to eight weeks after the operation. Nine of the cases failed. The two successful cases were healed one in five, the other in six weeks.

In conclusion, the author states that if the blood-clot method is used under favorable conditions, observing proper precautions in operating, in post-operative treatment, and in the selection of cases, we have a valuable method of wound repair.

Theisen.

Modification of the Simple Mastoid Operation Which Shortens Convalescence by Facilitating Wound Repair.

E. M. PLUMMER and H. H. GERMAIN, Boston, Mass. (*Journal American Medical Association*, November 24, 1906). The essential feature of this modification consists in removing the posterior osseous canal wall, as deeply as the facial ridge, together with a part of the roof and floor of the bony canal, pressing the soft structures carefully back into the cavity thus made, and closing the mastoid incision with sutures, a small gauze wick being allowed to remain in position until the soft parts are adherent to the bony walls. Adhesion is usually looked for at the first dressing subsequent to the operation.

Richards.

Simple and Radical Operations Under Local Anesthesia.

NEUMANN, Vienna (*Archives of Otology*, Vol. XXXV, No. 4). This method is indicated in the operation for acute mastoiditis where no subperiosteal abscess exists in all except very nervous individuals and especially in those in whom general narcosis is contraindicated.

The patient must take a hearty meal before the operation, as experience has shown that no toxic symptoms will then arise even when large doses of cocain are given. The solution recommended for injection is 5 cc. of a 1 per cent cocain solution plus 12 drops of adrenalin plus 3 cc. of normal salt solution. The injections are made in the line of incision, usually three in number (one at the upper end of the auricle, another at about the center, and the third at the mastoid tip), and two along the anterior surface of the mastoid process. These last injections are of special importance. If they are not

carried out the patient suffers excruciating pain, especially if there is caries of the posterior wall of the meatus. One must not pull too forcibly on the periosteum and not chisel away too large pieces of bone in order to avoid physical shock. Before chiselling, place a small pillow below the patient's head and have some one converse with the patient in order to divert his mind.

In the radical operation one must combine the injection method employed above with that devised for the extraction of the hammer and incus. A solution 50 per cent stronger is used. The order of injection is in such a way that the last injection is where the last operative procedure is to be made. Having anesthetized the mastoid, four syringefuls are injected into the four walls of the meatus at the place of union of the cartilage and bony parts.

The author has performed 20 radical operations under this local anesthesia and in his latter cases without causing the least pain except in curetting the opening to the Eustachian tube. The duration of the operation and the anesthesia lasted in some cases an hour and a quarter. *Campbell.*

Acute Purulent Otitis and Mastoiditis, Treated by Means of Artificially Induced Hyperemia, According to the Method of Bier, With Report of Cases.

KOPETZKY, New York (*Archives of Otology*, Vol. XXXV, No. 4). The author's observations in eight cases leads him to believe that

1. If Bier's method is used early it will greatly increase the probabilities of curing the condition without resort to major operative measures.

2. In cases cured under its influence the re-establishment of ear function will occur quicker than under the usual line of treatment.

3. Its use by the inexperienced is absolutely dangerous.

4. Its employment should be limited to the young and the otherwise healthy.

5. Finally, when the indications are kept in mind and when properly and intelligently used, when its scope and limitations are better understood, this measure is destined to find a permanent place in otologic therapeutics. *Campbell.*

Some Points In the Diagnosis of the Complications of Temporal Bone Disease Based Upon the Study of 135 Fatal Cases.

WHITEHEAD, Leeds, England (*Archives of Otology*, Vol. XXXV, No. 5). The absence of classical symptoms is a striking feature of these cases.

Headache was almost uniformly present in those cases where a brain abscess was present.

Vomiting was very frequently noted, but was absent in half of the cases of uncomplicated cerebellar abscess.

Drowsiness or coma was about equally frequent in cerebral and cerebellar abscess.

Optic neuritis was remarkably common in the cases of meningitis, being present in 8 out of 33 cases.

Nystagmus occurred in 3 cases of cerebellar abscess. The patellar reflexes were absent in 4 cases of cerebral and in 2 of cerebellar abscess.

There was an antecedent history of chronic otorrhea in 21 out of the 33 cases of meningitis; in 17 out of the 20 cases of sinus thrombosis; in 20 out of 21 cases of cerebellar abscess; in 13 out of the 15 cases of cerebral abscess, and in 1 of the 2 cases of combined cerebral and cerebellar abscess.

Examinations of the cerebro-spinal fluid through a lumbar puncture were of no diagnostic importance.

Campbell.

A Case of Hysterical Mastoid Tenderness and Pain, Without Functional Disturbance.

LANGWORTHY, Dubuque, Iowa (*Archives of Otology*, Vol. XXXV, No. 5). A poorly nourished, anemic girl aged 14 complained of severe pain over the right mastoid process for a year past.

The tympanic membranes are normal; the mastoid processes are prominent but not edematous. The right mastoid area is very tender and painful. No neck tenderness. Functional tests are normal in both ears. Under suggestive and electrical treatment the mastoid pain entirely disappeared in less than one month.

Campbell.

Etiology and Pathology of Mastoid Empyema Complicating Acute Purulent Otitis Media.

SCHEIBE, Munich (*Archives of Otology*, Vol. XXXV, No. 5), makes a division of empyema complicating general dis-

eases and genuine empyema. The diplococcus of pneumonia is most frequently present in cases of genuine empyema, the streptococcus somewhat less frequently, while the staphylococcus is found in only a small percentage of cases.

While the kind of pyogenic germ may be a factor in the production of chronic cases, acute cases do not become chronic unless the vitality of the body is below par.

Bacteriologic research has shown that the same kind of bacteria are present in uncomplicated middle-ear suppuration as in those complicated with empyema of the bone.

Fourteen specimens were secured for microscopic study. They were all taken from cases in which perforation of the cortex had occurred and practically all showed changes well described as of a spongy transformation. In the ground substance of the bone closely crowded spaces about the size of a bone corpuscle were visible; these spaces were most abundant in the compact bone but were exceptionally formed in the trabeculae of spongy bone. Between them normal lacunae containing bone cells were present.

In some portions of the bone where spaces were cut obliquely, they were continuous with normal perforations of Sharpey. It was assumed that the spaces were enlarged Sharpey's canals, containing inflamed and swollen fibres of Sharpey. These changes in Sharpey's fibres were noticeable only in cases in which pus had perforated the cortex. They occurred immediately after perforation had taken place and disappeared again, or rather returned to normal after four to twelve weeks.

A noteworthy feature of the spongy transformed bone was the absence of pus between the bone and the mucous membrane. In the parenchyma of the red marrow, increase in the cellular elements and connective tissue was a constant feature. The consequent pressure caused atrophy of the fatty tissue in the marrow and finally also of the ground substance of the bone.

Campbell.

On the Operative Treatment of Purulent Meningitis.

HINSBERG, Breslau (*Archives of Otology*, Vol. XXXV, No. 5). Up to the present time there are at least ten cases recorded where meningitis has been cured after drainage of the subarachnoid space and five in which there has been decided improvement. Active treatment of purulent meningitis is not only allowed, but under certain conditions, indicated.

Of greatest importance is the broad exposure of the area where the infection of the meninges took place and where it is reasonable to suppose the principal focus is situated.

Though the chances of recovery are greatest in beginning cases, yet as Kuemmel's case of generalized meningitis, which was characterized by the severest clinical symptoms with purulent cerebro-spinal fluid, recovered, we must always after a primary lumbar puncture, drain the arachnoid space at or near the site of primary infection.

In cases of otitic meningitis where the symptoms are such that an exact diagnosis is not possible, an exploratory operation does not carry with it great danger to the patient and is just as much indicated as a puncture of the brain in suspected abscess, or the opening of the sinus in phlebitis.

Campbell.

Primary Cavernous Sinus Thrombosis Secondary to Osteomyelitis of the Petrous Pyramid.

ARNOLD KNAPP, New York (*Archives of Otolaryngology*, Vol. XXXV, No. 5). A man, aged 30, suffering from diabetes and ozena developed a left otitis media for which paracentesis was performed twice. This discharge ceased and he suffered from severe headache in the right half of the head. The right eye began to protrude and he was admitted to the hospital. The right membrana tympani was thickened and red but did not bulge. No mastoid nor frontal sinus tenderness. Two days later the left eye was protruding and there was chemosis of the conjunctivae. The right tympanic membrane was incised and the escaping pus contained diplococci in capsules.

Restlessness and sleep were followed by twitching of the head and limbs, coma and death.

On autopsy the dura was found unusually adherent to the skull. The blood vessels in the right Sylvian fissure were thrombosed and purulent. Over the lower anterior extremity of the right cerebellar lobe was some purulent exudate. In the right sigmoid sinus was disintegrated purulent clot. The cavernous sinuses contained thick, creamy pus.

At the apex of the petrous pyramid there was a round carious defect 1 cm. in diameter. Just underneath the Gasserian ganglion another defect was found along the superior petrous margin somewhat externally but communicating with the cavity at the apex of the petrous pyramid.

The antrum and mastoid were entirely filled with swollen granulations; this infiltration extended inward from the antrum, just above the external semicircular canal, through the cancellous tissue and communicated with the carious areas near the petrous apex described above. *Campbell.*

The Changes in the Eye-Grounds in Otitic Disease of the Brain, the Cerebral Membranes and the Sinuses.

TAKABATAKE, Japan (*Archives of Otolaryngology*, Vol. XXXV, No. 5). 1. Changes in the optic nerves may be absent in any intracranial complication of aural and temporal bone suppurations.

2. They are more frequent in a combination of various kinds than when only one of the possible intracranial complications is present.

3. The more marked development of the eye-ground changes on one side does not prove the exclusive involvement or greater development of the original disease on the same side of the skull.

4. Changes in the optic nerves do not furnish aid in prognosis. The appearance or increase of the neuro-retinitis after evacuation of the pus from the cranial cavity does not of itself render the prognosis more unfavorable.

Campbell.

Report of Four Fatal Cases After Purulent Otitis.

HOELSCHER, Ulm (*Archives of Otolaryngology*, Vol. XXXV, No. 4). Case 1.—A man, aged 24, with an acute otitis media suppurativa had a persistent one-sided headache most marked at the supraorbital foramen. Paracentesis was followed by more profuse discharge but the bone above the auricle remained very tender.

On operation the mastoid was found sclerosed. When the bone in the region of the upper auditory canal wall was removed a large quantity of yellowish pus suddenly escaped.

His condition improved for the next week. Then very severe pain set in over the distribution of the left trigeminal nerve. The brain was punctured without striking any pus. His condition grew rapidly worse and maniacal symptoms preceded death.

On autopsy there was found on the roof of the tympanum a very small fistula which communicated with the extradural abscess, drained at the time of operation, and this in turn produced the abscess found in the temporal bone. The path of infection in the production of this abscess was not found as no fistula was revealed in the dura and the dura on its inner surface appeared normal.

In the posterior cranial fossa and in the vertebral canal there was a large quantity of thin pus. The extradural abscess had extended posteriorly to the petrous pyramid, then downward between the sigmoid sinus and the internal auditory meatus where the dura became necrotic and an entrance was made under the posterior cranial fossa.

Case 2.—A man, aged 22, who had previously suffered frequently with pain in and discharge from the ear, was taken ill with la grippe. He had chills, severe headache, especially at the occiput, and the right ear began to discharge. Tenderness over the transverse sinus and jugular bulb suggested a sinus trouble, but at operation there was no reason to suspect this, as there was no fistula or carious area of bone leading to the sinus. For several days the general condition was much better, then headache returned with an evening rise of temperature. There was albuminuria, followed by occasional convulsions which involved the entire body. Stupor preceded coma and death. On autopsy two drams of pus were removed from the base of the brain and a large quantity escaped from the vertebral canal. There was no abscess. The dura was firmly united to the bone at the base of the skull. There were no fistulae. The sinuses were normal. The diagnosis was cerebrospinal purulent leptomeningitis with internal hydrocephalus.

Case 3.—A man, aged 21, took cold, had pains in the chest, was feverish, and complained of deafness. Nearly a month later he had an attack of tonsillitis, followed by discharge from both ears and tenderness over the left mastoid process, pain in the left side of the head, and vertigo. Mastoid tenderness and vertigo increased, he became stuporous and had convulsive seizures. The pulse was weak, 120-130.

On removing the mastoid cortex the first blow of the chisel revealed a dirty greyish membrane which proved to be the anterior wall of the sinus. The bone between the auditory canal and the sinus was not more than 2 mm. in thickness. The sinus was exposed from the upper knee downwards and found

filled with clot. The cutaneous incision was prolonged downwards along the anterior margin of the sternocleidomastoid muscle and a green cylindrical body as large as a little finger was exposed, doubly ligated and divided. The pulse was so weak that stimulation was required during the operation. Death ensued the same evening.

On autopsy the dura appeared normal. The disease of the sinus was the result of the direct contact with diseased bone. When the dura was incised yellowish pus appeared at the posterior part of the left temporal lobe. This small circumscribed meningitis joined the diseased transverse sinus. Perforation of the walls had not taken place.

Case 4.—A man, aged 21, was taken ill with influenza and the symptoms were gradually transformed to those of a septicopyemia, possibly originating from the middle ear suppuration which ensued. Temperature ranged from 37.6 to 40.5° C., and pulse 90 to 120. All the joints were tender.

The patient died and on autopsy the left sigmoid sinus contained a thrombus extending into the jugular foramen. On the side towards the petrous bone there is a collection of thick yellow pus where the dura is necrotic and roughened bone is exposed. The tympanum and mastoid process contains yellow pus. The dura in an area corresponding to the left transverse sinus lacks lustre and is greenish yellow.

Campbell.

A Case of Brain Abscess Following Traumatism and Acute Mastoiditis—Operation—Recovery.

A Case of Hysteria Simulating Brain Abscess After Operation for Secondary Mastoiditis.

WIENER, New York (*Archives of Otolaryngology*, Vol. XXXV, No. 4). Case 1.—A man, aged 43, after a traumatism suffers with hemorrhage from the right ear and amnesic aphasia in the ear opposite to the side of the lesion. Three days later the hemorrhage is replaced by a serous discharge. This ceases after a few days and the patient is on the way to recovery and the amnesic aphasia begins to disappear when there suddenly develops an attack of tonsillitis, followed by an acute otitis media purulenta and mastoiditis. On operation the roof of the antrum and tympanic cavity were found completely destroyed; on the overlying dura was granulation tissue. Sufficient, apparently,

was found to account for the symptoms present. Neither the temperature nor the other symptoms were appreciably affected by the operation, so further exploration was made and an abscess found in the posterior portion of the temporo-sphenoidal lobe. After drainage the further course was uneventful.

Case 2.—A man, aged 22, who had had a suppurating right ear since childhood, was operated upon three months before coming under observation for an acute mastoiditis. As two fistulae persisted he has had two further operations. On the fifth day after the last operation, when the cells at the zygomatic root and mastoid tip were removed, he suddenly complained of pain over the top of the head, became restless, irritable, and collapsed. Suspicion was directed to either a sudden cerebral hemorrhage or the reawakening of a latent brain abscess. The operative wound was exposed and appeared healthy. Hemorrhage was excluded by the slow pulse, regular respiration, and practically normal temperature. Against the probability of brain abscess, there was not the slightest paresis of any of the muscles supplied by the cranial nerves. There was no hemiplegia, paraplegia or monoplegia, no spasticity or rigidity in the muscles. The optic discs were normal. The patient was anesthetic on both sides of the body with the exception of the soles of the feet, tips of his toes, palms of his hands and finger tips, and within the vestibule of both nostrils. Such a distribution of anesthesia could only be a neurosis of hysterical origin.

Next day all symptoms except slow pulse had disappeared, and although he had another similar attack he made an uninterrupted recovery.

Campbell.

On the Occurrence and Absence of Crossed Paralysis and Disturbances of Speech in Otitic Suppurations of the Brain and Meninges

TAKABATAKE, Japan (*Archives of Otology*, Vol. XXXV, No. 5). Sahli maintained that because in a very incomplete cerebral hemiplegia, the leg is less affected than the arm it would seem that the crossed paralysis occurring in these paralyzes could be produced only by an injury of the internal capsule.

The inflammatory edema which in many cases surrounds the temporal lobe abscess, can easily extend to the internal capsule

while the central convolutions are protected by the Sylvian fissure against this force for some time, because the pia in this fissure does not become inflamed in the form of a leptomeningitis. In addition, all disturbances which can be produced by an injury to the internal capsule may occur in an otitic abscess of the temporal lobe.

The presence of a crossed paralysis does not prove that the abscess is large, but that either the abscess is large or there is an inflammatory disease of its surrounding tissues, an edema or more properly a toxic or bacterial encephalitis.

Large intracranial abscesses and tumors have been observed in patients where there was no crossed paralysis, no hemianopsia and no disturbance of speech.

In purulent leptomeningitis the conditions are quite different. The cerebral symptoms of irritation and paralysis, if they are not produced by direct injury of the cranial nerves at the base, are affected from the cortical centres. It is indifferent whether this is the result of the pressure exerted by an exudate or by associated involvement of the cortex.

Campbell.

**A Case of Chronic Suppurative Inflammation of the Middle Ear
With a Late Development of Serious Mastoid and Tympanic
Symptoms.**

D. B. ST. JOHN ROOSA, New York. In this instance only temporary relief followed the mastoid operation. High temperature recurred and quinin, one grain hourly, was given with good result. The fever regularly abated and the ear gradually healed both in mastoid and tympanum. As there was no evidence of any kind of extension to the sinuses or to the brain, further surgical operation was not deemed advisable until after the quinin had been tried.

The author thinks the general surgeon ought to be on his guard in cases in which, after an apparently thorough operation, the cases do not do exactly as desired. He thinks there is a great temptation to pursue further operative treatment for a suspected brain abscess, and that to perform an operation to make a diagnosis is, in his judgment, an irrational, and in some cases, a dangerous procedure.

Richards.

A Case of Primary Thrombosis of the Lateral Sinus, Running Its Course With Operation, and at No Time Having Any Involvement of the Middle Ear.

FRANK M. CUNNINGHAM, New York (*American Journal of the Medical Sciences*, April, 1906). The patient had a fluctuating temperature and the chilly sensations of a septic process, but repeated examination of both ears showed no pathologic condition and no point of tenderness on careful palpation over the mastoid area.

The symptoms continuing, an operation was done. The sub-cortical cells showed no evidence of the presence of any active inflammation, having the appearance of diploic structure, somewhat reddened and congested. The covering from the sigmoid sinus was removed and the sinus uncovered from its knee through the descending portion, almost to its turn upwards, where it joins the inferior petrosal to form the jugular bulb. The vessel was blackened and had every appearance of an acute, diseased condition throughout the exposed area. In removing the bony covering at the knee it was seen that the vein wall had undergone a softening, degenerative process, and the tissues were easily torn when an attempt was made to uncover the vessel. Some hemorrhage resulted, but not sufficiently free, so the vein was incised along its anterior surface. The flow from above was profuse and this was blocked with iodoform gauze. The upward flow was obstructed by what was evidently a parietal thrombus, which was removed and the wound packed with gauze and allowed to heal from the bottom. Recovery was gradual, uneventful and complete.

The author does not, however, advocate the introduction of the curette, even though his case recovered, as he thinks that there is always danger of the breaking up of the clot and the dropping of particles of infected matter through the circulation of the internal jugular, with a consequent septic process in the lung and the formation of metastatic abscesses in other parts of the body.

Richards.

Concerning the Differential Diagnosis Between Otitic and Metastatic Brain Abscess.

OBENDOERFER, E. (*Deutsche medicinische Wochenschrift*, October 4, 1906), reports the following case to show the difficulties in diagnosing and localizing brain abscesses: G. W., aged 23 years, had for seven years a purulent discharge from

the right ear. For four years he had been suffering from an almost constant cough with profuse expectoration. A week before his admittance to the hospital, he suddenly developed dyspnea, with convulsive movements of the left arm. He had a similar attack a few days later, followed by some difficulty in moving the left arm and leg. On physical examination of the chest, whistling rhonchi were heard all over. There was a profuse purulent expectoration. No tubercle bacilli were found. The heart and abdominal organs were found normal. The urine contained albumin and a few hyalin casts.

Nervous System.—Sensorium free.

A slight paresis of the left arm was found. The left leg was held stiffly when patient was placed on his back. In walking, the left leg was dragged, the left arm being held rigid, and away from the body.

Reflexes.—Patellar reflexes similar, and rather exaggerated. No Babinski. Pupils similar, and reacted to light.

Ear.—Right tympanic membrane had been destroyed. There was a profuse discharge of brownish, foul smelling pus from the right ear. No symptoms on the part of the mastoid.

The patient complained of headache, and three days after he was admitted to the hospital, he had a severe attack of vomiting. Slight convulsive movements of the left arm and leg were again noticed. The sensorium remained free even during the convulsive movements. Two days later the left-sided paresis had increased and patient was drowsy. Patient was sent to the operating room with the diagnosis of a cerebral abscess, probably of the right temporal lobe.

At the operation, the dura was found practically normal. The brain was explored eighteen times in different directions, but no pus was found. The mastoid and tympanic cavity were then opened, but nothing particularly pathologic was found. Patient died an hour after the operation. Autopsy showed both pleural cavities obliterated. Left lung was very edematous. Bronchial mucous membrane swollen, reddened, and covered with a foamy secretion. On examining the brain, the dura was found adherent to the skull at several points. The right hemisphere was larger than the left. In the middle of the right parietal lobe a large abscess cavity, filled with about 30 cm. of thick pus, was found. The entire right tympanic cavity was found filled with granulations. A brain abscess of otitic origin, located in this part of the brain, is extremely un-

usual, as they are almost always located either in the temporo-sphenoidal lobe or in the cerebellum.

Heimann has collected 819 cases from the literature (the most complete statistics to the present time) showing that this rule is nearly always true.

Koerner and others have, however, been able to collect 18 cases, in which otogenous brain abscess occurred in other parts of the brain, as for example, in the central convolutions, in the frontal lobe, fissure of Rolando, parietal lobes, optic thalamus, and the fourth ventricle. Such abscesses must at times be regarded as metastases from otogenous sinus thrombosis, decubitus, and purulent bronchitis.

The author regards his case as belonging to this class, and is of the opinion that the patient's purulent bronchitis was the source of infection. Next to the traumatic and otitic brain abscesses, those resulting from pulmonary conditions, such as gangrene and abscess, pneumonia, empyema, bronchiectasis and putrid bronchitis, are most frequent. *Theisen.*

II.—NOSE.

Anatomy of the Nose and Accessory Sinuses.

E. OPPIKOFER (*Archiv. für Laryngologie*, Bd. 19, Hft. 1), as a result of 200 dissections of the nose, comes to the following conclusions:

1. In the majority of cases, the floor of the antrum lies deeper than the floor of the nose.

2. Protrusion of all the teeth in the neighborhood of the antrum was observed only once. The roots were all covered by a thin layer of bone. Only in one case was there found a root without a covering layer of bone free under the mucous membrane in the cavity. This was in the case of a wisdom tooth.

3. In two cases the antrum was found markedly narrowed. In two further cases, it was divided once by a bony and once by a membranous septum.

4. The average length of the ostium maxillare is 5.4 mm., and the average breadth 2.7 mm. The smallest opening found was 2 mm. in diameter, the largest had a length of 17 mm. and a breadth of 11 mm.

5. An accessory foramen of the antrum was found about once in nine cases, more frequently unilateral than bilateral.

An accessory foramen was also found in children, not less frequently (twice in ten cases) than in the cases of adults.

6. As a rule it is not possible to probe the maxillary opening. The introduction of a probe from the middle meatus is to be preferred to introduction from the lower meatus.

7. Antra and ethmoid cells were present in all our cases. The frontal sinus on the other hand was absent in 7 instances (3 times on one side and 4 times on both sides) out of 190 cases. The sphenoid was absent in 5 cases (4 times on both and once on one side).

8. The septum was absent in the frontal sinus in 2 cases, and in the sphenoid in 14 cases, so that a single cavity was found. Furthermore in both frontal and sphenoid sinuses, the septum was now and then found partially absent, so that the two spaces communicated. This last anomaly was observed twice in the case of the frontal sinus, and 6 times in the case of the sphenoid.

9. Cystic dilatation in the middle turbinate was found in 27 out of 190 adults, but only in one case was this so marked as to produce interference with respiration.

10. Inflammations of the accessory sinuses are frequently found in the cadaver, in 94 out of 200 cases, at times catarrh, at others suppuration. Empyema were found in about every fourth case, but it is not possible to make a sharp distinction between catarrh and suppuration.

11. The inflammatory alterations in the accessory sinuses are usually of slight extent. They represent acute terminal affections, and have arisen under the influence of the prostrating general disease. They are found in the case of infectious diseases, including tuberculosis, not more frequently than in other diseases of a slower course.

12. When examination shows suppuration of a sinus, it is not usually possible to determine absolutely whether this is acute or chronic. We must seek aid of the history, and of the examination made during life.

13. Since inflammations of the sinuses found in the cadaver are usually acute, it is not right to compare, without further consideration, the results of the autopsy with clinical material, since the latter rests chiefly upon operative cases, which are usually chronic.

14. The majority of acute inflammations of the sinuses arise primarily independent of rhinitis.

15. According to our statistics, the antrum is most frequently diseased (38 per cent of the cases) then follow ethmoid in 18 per cent, the sphenoid is affected in 9.5 per cent and the frontal sinus in 7.5 per cent.

16. At times in the same individual, only one cavity is affected, while in others several on the same side may be diseased. An isolated sinusitis was found in 27.5 per cent of the cases, and a combined inflammation in 19.5 per cent.

17. Of the 94 cases of sinusitis, 60 per cent were in men and 35 per cent in women. Although in the first period of life the accessory sinuses are undeveloped, we find nevertheless sinusitis especially frequent.

18. In marked icterus the mucous membrane of the nose and sinuses is colored yellow. If serous exudate is present in the sinus, it assumes a yellow color.

19. In 16 out of 200 cases, stomach contents were found in the sinuses, most frequently in the antrum. This is due to transference after death, and it does not justify us in considering vomiting one of the etiologic factors of sinusitis.

20. In addition to the stomach contents, the cavities contained at times water and blood, which entered the cavities during the autopsy. In one case pus was found in all the sinuses, coming from pyopneumothorax.

21. Polyposis of the nasal mucous membrane is found in 6 per cent of the cases, particularly about the neighborhood of the maxillary ostium. The polypoid degeneration was slight in all cases, and only in one case was so marked as to constitute obstruction to respiration. A genuine mucous polyp was found only in one sinus, namely in the antrum.

22. Our material shows that certain of the advanced cases of genuine ozena occur with perfectly normal sinuses and without focal suppuration.

23. A larger percentage of tuberculous individuals was found among the leptoprosopes than among the chamaeprosopes.

24. Pavement and transitional epithelium occurs frequently upon the turbinates, over larger or smaller areas.

25. These two types of epithelium frequently occur on only one of the other 4 turbinates examined, and not uncommonly only over limited regions.

20. The lower and middle turbinates contain pavement epithelium with equal frequency.

27. The pavement epithelium occurs with the greatest frequency upon the side of the turbinate directed to the septum, while it is less common upon the lateral aspects.

28. Pavement epithelium is found in the anterior portions of the nose, much more frequently than in the posterior. When it is encountered in the posterior half of the turbinates, there are usually large areas of pavement epithelium present in the anterior portion. Only in two cases was pavement epithelium found exclusively in the posterior portion of the turbinates.

29. Pavement epithelium which is found in the majority of cases in the anterior portion of the turbinates, extends from here in a posterior direction in long lines. Islands of pavement epithelium are much less common.

30. Pavement epithelium varies as regards the number of cell layers, the compactness of structure and the size of the individual cells, not only in the same case, but also in the same sinus.

31. When pavement epithelium is arranged in papillae, these are most marked in the anterior regions and diminish in size and number posteriorly.

32. Among 126 sinuses which contain pavement epithelium, 40 showed here and there horny alterations, which was, however, marked in only 7 cases. This horny change is independent of the thickness of the epithelium and of the number and size of the papillae.

33. In the majority of cases, the basement membrane lies under the pavement epithelium.

34. Pavement epithelium is found more frequently in men (72 per cent) than in women (55 per cent).

35. In ozena, pavement epithelium is found regularly. Nevertheless the occurrence of this is not peculiar to ozena alone, since it may be found in a marked degree without fetor or crust formation in ordinary chronic rhinitis, and even in cavities which microscopically appear normal. Extensive areas of pavement epithelium simply demonstrate that marked injury has been exerted upon the mucous membrane.

36. In ozena the amount of pavement epithelium is not proportional to the degree of atrophy of the turbinates. The reverse is also true.

37. Metaplasia of the epithelium of the turbinates is independent in our cases of sinus suppuration.

38. In one interesting case squamous epithelium of the in-

terior of the nose developed from a mucous membrane with metaplasia.

39. The distribution of the glands is normally irregular in the lower turbinate. Their number diminishes from the front towards the rear, so that the anterior third is markedly richer in glands than the posterior.

40. Pigment in the connective tissue of the turbinates is found in normal and pathologic mucous membranes, and is not related to the definite local and morbid process, or to a definite general disease. It is found particularly in the anterior portions of the nose, and is markedly more common in the middle turbinate than in the lower turbinate.

41. The importance of the so-called intraepithelial glands of the mucous membrane is overestimated, since they occur regularly in normal tissues, although, to be sure, frequently only in individual instances.

42. In normal and inflamed mucous membranes, cavities occur in the epithelium of varying size and form, which have arisen through the coalescence of neighboring cells. These cavities are either empty, or contain mucus or detritus, frequently nuclei. They often show immigration of leucocytes.

43. The thickness of the cylindrical epithelium of the nose varies from 32 to 200 mikra. Exceptionally the epithelium of the nasal mucous membrane may be here and there thinner than the epithelium of the sinus.

44. Usually a basement mucous membrane is absent in the mucous membrane of the sinus, or is present only over a short distance. It may, however, be found in all the sinuses.

Goodale.

A Contribution to the Histology of the Lower Turbinate.

INOKICHI KUBO (*Archiv. für Laryngologie*, Bd. 19, Hft. 1).
—Histologic details which should be read in the original.

Goodale.

Suppuration In the Accessory Sinuses of the Nose.

LEWIS and A. LOGAN TURNER, Edinburgh, Scotland (*Edinburgh Medical Journal*, November, 1905).—As the result of a careful anatomic and clinical examination of a large number of healthy nostrils and of fifty-seven antral cavities which were the seat of suppuration, the authors have reached the fol-

lowing conclusions.

1. That the organisms found in the healthy nasal cavities belong to the same varieties as those occurring in abnormal conditions of the nose.

2. That the pus obtained from some cases of antral suppuration may combine organisms similar to those occurring in the buccal cavity.

3. That occasionally bacilli distinctive of dental caries may be isolated from the pus of an antral abscess.

4. That the healthy accessory sinuses are probably sterile.

5. That there are three main types of organisms commonly met with in suppuration of the accessory sinuses, namely, streptococci, pneumococci, and staphylococci.

6. That in the cases of chronic suppuration streptococci were found in 80 per cent, whilst in the more recent cases they occurred in 60 per cent.

7. That the swabs taken direct from the affected cavities provide from the bacteriologic standpoint more trustworthy results than swabs taken in the same cases from the nasal cavities.

8. That in recent cases virulent organisms are met with twice as often as in cases of chronic suppuration.

9. That clinical evidence supports the view that the antrum is more frequently infected by way of the nasal cavity, and that this opinion is corroborated by bacteriological investigation.

10. That nasal polypi occur more frequently in cases of associated sinus suppuration than in simple cases of antral abscess; their association with ethmoidal cell suppuration, whether occurring alone or as a complication of other sinus inflammation, is evident from the cases quoted.

11. That the recent cases of uncomplicated antral suppuration, as contrasted with those of a chronic type, respond more readily to treatment by lavage.

Richards.

Killian's Operations.

HARRIS P. MOSHER, Boston, Mass. (*Boston Medical and Surgical Journal*, October 11, 1906).—Conclusions, in view of his well-known familiarity with the anatomy and pathology of these affections, are especially interesting, and show that the surgical pendulum, so far as radical sinus operations are con-

cerned, is beginning to swing somewhat toward the normal. The final paragraph of his article is quoted entire.

"In cases of chronic frontal sinus disease there is no routine operation. With certain men the Ogston-Luc operation is practically a routine procedure; with other men, and, until lately I have belonged to this group, the granulating method has been used to the extent of routine. I have been surprised to find in some of my cases that the simpler method of opening the sinus, removing septa and the mucous membrane, and then making a large opening down into the nose, has succeeded. I feel, therefore, that in the future I shall try, in suitable cases, the simpler methods more than I have in the past. If they succeed I shall do the patient a great favor. If they do not, the more vigorous measures are still open. Do not misunderstand me, I am heartily in sympathy with the radical method of operating. In certain cases it is the only operation which will cure or approximate a cure. I say approximate a cure, because the more I see how hopelessly complicated the anatomy of some of these cases is, the more I feel that in many of them to approximate a cure is the best that can be done. To conclude, my experience for the last year convinces me that in certain cases the simpler methods of operating for frontal sinus disease are still worth a preliminary trial. Give them a trial, but do not make them an excuse for temporizing. If they fail, at once use either the granulating method or the method which goes under Killian's name."

Richards.

The Accessory Nasal Sinuses and Pneumococcus Infections.

SAMUEL T. DARLING, Ancon, Isthmus of Panama (*Journal of the American Medical Association*, November 10, 1906).—The investigation is being conducted to determine the relation of inflammations of the accessory nasal sinuses to pneumococcus infections. In 52 autopsies there were 37 of pneumococcus infection, and 92 per cent of these showed in a very marked degree more or less typical pneumococcus inflammation of one or more of the accessory nasal sinuses. The inflammation was generally intense, fibrino-purulent in character, fibrin and mononuclear cells being abundant. Pneumococci were present in every case, and in numbers depending on the duration of the process. The age of the sinus affection was appreciably greater than that of the lung or meningeal lesion.

Ninety-one per cent of the lobar pneumonia cases showed a sinusitis.

All cases of acute pneumococcus meningitis presented an inflammation of one or more of the sinuses, and in every one the middle ears and mastoid cells were normal.

The author believes that the port of entry of the pneumococcus is in most instances an accessory nasal sinus, the mucous membrane of which is probably fitted for the reception of the pneumococcus by an antecedent influenza or rhinitis, instances of infection from a carious tooth being rare.

Richards.

The Submucous Resection of the Nasal Septum. With a Report of Fifty-Six Operations.

J. F. BYINGTON, Battle Creek, Mich. (*Journal American Medical Association*, January 12, 1907).

The Submucous Resection of the Nasal Septum. Some Remarks Based on Seventy-Five Cases.

LEE M. HURD, New York City (*Journal American Medical Association*, January 12, 1907).

Subperichondrial and Subperiosteal Operations on the Nasal Septum.

ROBERT C. MYLES, New York City (*Journal American Medical Association*, January 12, 1907).

These three articles constitute a symposium read before the American Medical Association on the submucous resection of the septum, and seem to show that up to date this operation, with its various modifications as evolved by individual operators, is producing better results than any previous septum operation. What the ultimate results with reference to regeneration of cartilage and falling in of the front of the nose are to be, only the future will tell. Up to date there seems to have been little or no trouble with after-complications of this operation. There are a few perforations, but they seem to give no trouble, and the results as to breathing seem to be uniformly satisfactory.

In the discussion which followed it seemed to be the consensus of opinion that the operation was not adapted for children. In the few instances in which it might be done in children, care

should be taken to remove no more cartilage than would seem to be absolutely necessary, on account of the future development of the child. Dr. Roe deprecated the removal of the entire or greater portion of the separating framework of the septum, believing that fallen nose might follow.

As to the time required, one hour or more seemed to be the average; fifteen to thirty minute cases being decidedly in the minority. Some cases require two hours; whatever is necessary to do the operation carefully and without hurry. It is only necessary to remove so much of the septum as will give sufficient breathing space on each side.

Richards.

Atrophic Rhinitis: A Reproach to Rhinology.

GEO. L. RICHARDS, Fall River, Mass. (*Journal American Medical Association*, January 5, 1907). The author thinks that atrophic rhinitis has been neglected by rhinologists; that it ought to be studied with more care and an endeavor made to get at the true theory of causation. He reviews these theories of causation but does not find any of them really satisfactory. The therapeutics up to the present time have been almost purely empirical. The results have been very disappointing.

Sarcoma of the Nasal Fossa.

RICHARD H. JOHNSON, Baltimore, Md. (*Medical Record*, December 8, 1906). The sarcoma occurred in a woman sixty-five years of age. It consisted of a grayish, white mass, having its origin apparently in the antrum, and breaking through into the nose with infiltration of its structures. The septum was not involved. The operation and removal was only partially successful. Prompt recovery occurred from the operation, but the tumor recurred as promptly. The operation seemed to stimulate the growth of the tumor, and in a few weeks a large, red, vascular mass was hanging out of the nostril. A second operation was declined and death occurred two months after the original operation.

The author thinks cases like this show how helpless we are against cases of malignant growths in the head, and that unless operation can be done very early, it will be followed by recurrence and more rapid growth of the tumor. Unless we are reasonably sure of removing the entire growth, it is better not to operate, an opinion which the reviewer, who has seen sev-

eral such cases of sarcoma of the upper jaw, would unhesitatingly corroborate.

Richards.

The Treatment of Ozena By Paraffin Injections.

BLAH (*Archiv. für Laryngologie and Rhinologie*, Bd. XVIII, Heft. III, 1906). Since Gersuny published his work as to the correction of nasal deformities with paraffin, a considerable number of reports, recommending this remedy in ozena cases have appeared. Paraffin has been used for the treatment of such cases only for a comparatively short time, but there are nevertheless a surprisingly large number of apparent cures on record.

A cure in ozena cases can, however, be considered only in a relative sense, as the etiology of ozena has not as yet been positively worked out.

In a majority of the cases on record, good results were reported after short periods, before the patients were under sufficiently long observation.

In other cases neither the length of time of the treatment nor the period of observation after the conclusion of the treatment was stated. The author reports a series of ten ozena cases, in which this method of treatment was used, and the result of the treatment after from one to two and one-half years is given. The author has treated a much larger number of cases by this method, but only the cases that were under observation over a year are given. The patients were all young adults and children, between the twelfth and forty-fifth years. The technic employed in all the cases was as follows: Paraffin with a melting point of 45° C., after a thorough removal of the nasal crusts, was injected under the septal mucous membrane and into both atrophied inferior turbinates. About 0.5 cm. was used at each injection. Some difficulty was experienced at first in getting the paraffin under the very thin turbinal mucous membrane. It was noticed that after each injection the nasal secretion became much thinner and more copious, the crust formation disappearing after about 24 hours. The odor from the nostril treated also became much less and in time disappeared. The nasal secretion, after the paraffin injections, was like that during the stage of resolution of an acute coryza. After several days the crusts reappeared, but in smaller quantities, and in the first patient treated, a young man aged 25 years, with a typical bilateral ozena, the crusts finally disap-

peared entirely. The patient was well two years after the discontinuance of the treatment. This same good result was obtained in all the cases. The number of the injections varied according to the severity of the individual cases. In the cases in which paraffin could not be injected under the turbinal mucous membrane, it was injected under the septal mucous membrane, in order to narrow the abnormally wide nostrils. Ordinarily ten or twelve such injections sufficed. Paraffin, with a melting point of 45° C., was employed, because it was found that when hard paraffin was used the atrophied turbinal mucous membrane was easily torn and could not be elevated.

In conclusion, the writer states that this method of treatment is safe, because no serious complications were encountered in any cases in which paraffin was used.

Theisen.

Hay Fever and Persistent Bronchial Asthma Relieved By Treatment Direct to the Antrum of Highmore.

JACOB E. SCHADLE, St. Paul, Minn. (*Medical Record*, September 8, 1906). Schadle has had extremely good results in hay fever with hypersecretion by the insufflation of the sinuses with thymol iodid. He thinks the primary inflammation is in the antrum and that the passage of this discharge into the nasal passages inaugurates the nasal and nervous phenomena, owing to their irritative properties. The central and sympathetic nervous systems become thus disturbed by the local disturbance, and neurasthenic symptoms manifest themselves.

Richards.

Syphilitic Empyema of the Accessory Sinuses of the Nose, With a Report of Four Cases.

JOSEPH H. ABRAHAM, New York (*Medical Record*, March 3, 1906). The author reports four cases of syphilis of the maxillary antrum, and gives illustrations of a set of instruments which he uses for puncturing the antrum through the nose. In all of the cases he found the empyema to quickly respond to specific treatment, and found that small doses of iodids, increasing one grain three times a day, proved of greater value in the nose than larger doses rapidly increased. Operative measures should be delayed unless there are urgent symptoms until as great absorption of the gummatous infiltra-

tion, as the result of the administration of the iodides, as is possible has taken place.

Richards.

Head Pains and Eye Symptoms Caused By Inflammation of the Accessory Sinuses of the Nose.

C. R. HOLMES, Cincinnati, Ohio (*Ohio State Medical Journal*, February, 1906). There may be extensive purulent inflammation of one, several or even all of the sinuses on both sides without the patient ever having suffered from pain of any kind, provided there is free drainage, but the general health and the hearing are almost always affected. The most dangerous cases may have no sign of purulent secretion because of closure of the natural openings.

Increased experience in work on the sinuses confirms the author's belief that ozena as a distinct disease does not exist. He thinks that if free vent is given to all the pus-secreting cavities and they are all-opened and all dead and diseased bone removed, the ozena will invariably disappear.

After excluding cerebro-spinal and tubercular meningitis and trauma, and a small proportion of cases that may have had their origin from the head and neck outside of the nasopharynx and sinuses, he thinks that practically all cases of inflammation of the brain and its membranes are caused by extension of purulent inflammation from the ear and from the nose and its accessory sinuses.

Richards.

The Serum Treatment of Hay Fever.

CHARLES H. KNIGHT, New York (*Medical Record*, March 10, 1906). The author thinks that the etiologic importance of nasal conditions has been greatly exaggerated so far as their influence upon hay fever is concerned, and has not found that the serum treatment has as yet proved its value to any great extent. Experiments should be continued with the assurance that at least it does no harm, even though it gives results no better than those acquired by other methods.

In a personal letter to him Professor Dunbar has given three possible causes of failure.

1. "The patient does not react to pollen toxin, and is therefore indifferent to the antitoxin."
2. "Some patients are irritated by normal blood serum, and therefore also by pollantin."

3. "Many patients use too much of the pollantin." The contents of a vial should last from eight to fourteen days. The pollantin should be used in minute quantities and the treatment started before the attack begins. *Richards.*

The Use of Local Anesthesia With the Production of Anemia in the Radical Operation of Empyema of the Antrum.

NAGER (*Archiv. für Laryngologie*, Bd. 19, Heft. 1), states his procedure as follows: The patient is given a hypodermic injection of morphin 30 minutes before the operation. The interior of the nose especially laterally is thoroughly anesthetized by painting with a 10 per cent cocain and 1/10 of 1 per cent adrenalin solution. The antrum is then thoroughly washed out through the middle meatus, and receives 2 cmm. of Schleich's solution No. 2 (this contains 1/10 per cent cocain with 2 drops of 2 per cent adrenalin solution) in the region of the middle meatus. Cotton soaked with 10 per cent cocain and adrenalin is deposited. Anesthesia of the soft portions of the canine fossa is accomplished by the injection under the periosteum of the second ampulla of 1 centimeter of Bloch's adralgin. This contains 0.011 cocain with 0.1 g. 1 prom. of adrenalin solution 3 drops. For the submucous portions he takes 4 to 5 cc. of Schleich's solution No. 2 and 3 drops adrenalin solution, and distributes this over the whole canine fossa and the neighborhood of the incision. The operation can begin in 10 minutes. The incision into the soft tissues is felt only at times, but the removal of the periosteum in the neighborhood of the infraorbital nerve is found somewhat unpleasant. The patient also feels the chiseling of the bony wall more as a shock than as a pain. The advantages claimed for this operation are the absence of hemorrhage and the shortening of the time of performance.

(It may be questioned whether these advantages outweigh the discomfort to the patient, and the risks from the employment of the amount of cocain recommended.)

Goodale.

Frontal Sinusitis as an Etologic Factor in Acute. Retrobulbar Neuritis. Report of a Case.

BLACK (*N. Y. Medical Journal*, June 2, 1902). The evidence from the report is not at all conclusive that a true inflammation of the frontal sinus was present in this case. There was,

it is shown, a hypertrophic rhinitis which was benefited by operation. Further, that the neuritis was cured. It is not, however, demonstrated that treatment to the frontal sinus produced this result.

A Case of Acute Retrobulbar Neuritis Probably Due to Sinusitis.

ZENTMAYER (*N. Y. Medical Journal*, January 27, 1906). A woman, aged 27, presented herself for pain in the head, especially in the left temple, with failing sight in the left eye. There was a clear rheumatic history. Examination of the eye diagnosed retrobulbar neuritis. A purulent inflammation of the frontal and ethmoidal sinuses was also discovered. Under the salicylates and atropin she made a satisfactory recovery. The author reasoning from the statistics that 20 per cent of cases of empyema of the accessory sinuses are complicated by inflammation of the orbital contents, concludes that the sinus disease was the cause here.

(While it is true that retrobulbar neuritis is found very often associated with sinusitis there is not sufficient evidence in this case to justify that opinion. Rather does the rheumatic origin of the disease stand out, as shown by the rapid improvement following the salicylates.—Abstractor). *Harris.*

The Aims and Limitations of Intranasal Surgery In the Treatment of Chronic Nonsuppurative Affections of the Middle Ear.

HARRIS (*N. Y. Medical Journal*, April 14, 1906). As the result of his study of this question the author draws these conclusions:

1. The nose plays an important role as a causative factor in many cases of otitis media, but by no means in all such cases.
2. That the lesion in the nose is usually of an obstructive nature, acting as an obstacle to proper ventilation of the middle ear.
3. That in beginning cases of hypertrophic otitis media a certain amount of improvement in the hearing can confidently be expected by restoring proper ventilation of that cavity through measures addressed to the nose with the aim of relieving naso-pharyngeal and tubal inflammation; but that (a) only such cases of this disease call for nasal treatment as show pathologic changes in the throat, which demand attention of

themselves apart from the condition of ear; (b) that it is important to determine the true nature of the process in the middle ear, as the sclerotic or so-called hyperplastic form is not influenced at all by such treatment, and (c) that adhesive changes and ankyloses cannot be expected to yield, however completely the nasal obstruction is removed.

4. That an important result to be secured by treatment is the relief afforded from the repeated attacks of acute rhinitis, which by their effects on the Eustachian tube are wont to aggravate the chronic condition.

5. That tinnitus aurium and vertigo are at times benefited by nasal treatment.

6. And finally that because of the importance of treatment to the nose and throat a closer association clinically of otology and rhinology is urgently demanded.

Harris.

III.—MOUTH AND PHARYNX.

Certain Facts Concerning Fauical Tonsils.

CHARLES M. ROBERTSON, Chicago (*Journal American Medical Association*, November 24, 1906). This is a study in the anatomy and the relation of the tonsil to the superficial and deep lymphatics. It has been shown that there is an intimate relation between the cervical and bronchial chains, especially the peritracheobronchial, the intertracheobronchial, the inter-bronchial and the posterior intercostal chains. These gland chains communicate with the thoracic duct direct, but they also communicate with the cervical and subclavian glands by their anastomotic branches. Hence, an infection from the tonsil may be transferred to the upper lobe of the lung direct.

The author has been studying by means of microscopic slides the character of the tonsils which he has removed, having studied 232 such cases, without regard to symptoms complained of by the patient. The greater part of the tonsils were of the submerged type. He found 8 per cent of all the cases presented undoubted tubercular lesions in the form of giant cells and tuberculous tissue change. He thinks that large numbers of the apex tuberculosis cases may come from direct infection of the tonsil. He has found cases in which there was a tuberculous infection of one tonsil and not of the other, and has found a dull spot on the apex of the lung in the same side of the body as the infected tonsil. He has found the cervical

lymphatics which have been infected to gradually disappear after removal of the tonsil, the tonsil having been found to be tuberculous. The glands are able to destroy germs by their phagocytic property, but there comes a time when they are unable to compete with the great amount of labor heaped upon them.

He regards it as very essential that the tonsil when diseased should be removed, that when operated on for removal, it should be removed completely, and that pockets in the soft tissues around the tonsils must be destroyed. To do this there must be some mode of operative procedure more thorough than operations by the tonsillotome. The technic of enucleation with the scissors is then given. *Richards.*

Sudden Paralysis of the Pharynx—Artificial Feeding for Four Years.

S. WEIR MITCHEL (*Journal of the American Medical Association*, December 15, 1906) reports the following extraordinary case.

Mrs. E. S., aged 27 years, married, of good health and good personal and family history. About 18 months after her marriage on May 18, 1901, she was confined. Between this time and July 21, her health was perfect.

She went to bed on the night of July 21, without sign of trouble and awakened in the night with a chill and sore throat. By seven in the morning she could not swallow. From that day she has never swallowed a particle of food, being fed entirely by tube. On July 23, there was high temperature, reaching 104 to 106 in the evening, with much pain and great swelling of the neck, and considerable inflammation of the pharynx, arch of the palate and tonsils.

All effort at deglutition gave great pain, and the food choked her and was driven up into the posterior nares. She was seen at this time by a competent physician, who said there was no visible sign of diphtheria and no abscess of the tonsils. Within the next 48 hours, the left leg and arm became more cold to the touch than the limbs on the other side. There was marked ptosis of the left eyelid, and the face was slightly drawn to the right. Within the first 36 hours of the attack, she coughed up pus and blood in what she described as large quantities. This lasted three days, and then rather suddenly disappeared. A painful swelling of the left wrist occurred about

this time and there was much pain in the muscles generally. On August 5, 1901, she was taken to Johns Hopkins Hospital, the temperature being still as high as 102. A somewhat doubtful diagnosis of diphtheria was made there.

She was seen by Dr. Mackenzie, who, apart from the paralysis, found nothing abnormal in the larynx, pharynx, nasal passages and accessory sinuses. Deglutition was impossible and she had to be fed through a tube which could be passed to the stomach without difficulty. There was no suspicion of a swelling or growth in the esophagus.

Dr. Mackenzie removed some hypertrophied lymphoid tissue from the vault of the naso-pharynx, but this had no effect on the paralysis.

The idea of hysterical palsy had been considered and abandoned after electricity, hypnotism, and various drugs had failed to improve the patient's condition.

During the first year after treatment was given up, she lost 36 pounds in weight. Her teeth, previously sound, crumbled away like chalk.

In May, 1905, four years from the onset of the attack, the patient was examined by Dr. Mitchell. She feeds herself through a tube which is carried a little past the level of the larynx, and when food is poured through the tube it reaches the stomach without difficulty. She is quiet and unemotional. Dynamometer registers right 47, left 45.

Reflexes: Right knee jerk zero, and cannot be reinforced by motion or sensation; left knee jerk capricious, at times active and is reinforcible. Ankle jerks right and left, absent, as well as the plantar reflexes.

There is no Babinski reflex. The early acquired left ptosis is better, but is not absent and is worse whenever she is fatigued. The upper part of the face acts less quickly than the right.

On the outer aspect of the right leg there was total anesthesia, just above the knee, in a space some three inches in extent. The left leg was apparently normal. There is no disturbance of sensibility of the right arm.

Heat and cold are felt tardily on the entire right side of the body, and sensibility to cold is lessened.

Examination of the throat by Dr. Seiss, resulted as follows: The mucous membrane of the pharyngeal region was anemic; no gross lesions. The larynx could be examined with great

case, and an excellent view of the bronchial openings could also be obtained.

The larynx showed little except atrophy and anemia, and a remarkably normal membrane for a tube fed patient, in whom there is more or less traumatic laryngitis.

The entire pharyngeal region was more or less anesthetic. There was, however, no motor paralysis of the palate. There appeared to be both motor and sensory paralysis of the pharyngeal constrictor. The whole larynx seemed without sensation. There was no motor paralysis of the larynx, the cords approximating perfectly.

Dr. Seiss came to the conclusion that it was an extreme case of diphtheritic paralysis. The throat was so insensitive in this case that it was easy to examine the usually sensitive pharyngeal surface with the finger.

Not even saliva could be swallowed. It collected in the mouth, and was then allowed to drain out on a handkerchief. In the latest examination of the throat it was found that at the limit of the observer's powers to explore the pharynx, there was a firm growth in the middle line, projecting forward from the anterior face of the pharynx. It was very difficult to reach, and might easily have escaped observation. In fact, it must have done so. The tumor was about an inch wide at the level of the arytenoid cartilages. Its extent below was undetermined until an X-Ray picture not only revealed how dense this structure was, but also the extent to which it extended down the canal behind the pharyngeal mucous membrane. It was possible to carry a finger behind the larynx, so as to feel that there was scarcely any room between it and this smooth, hard, rounded mass, which projected from the anterior surface of the pharynx. The mass was slightly tender on pressure, and too hard to penetrate with an exploring needle.

The reflexes were now generally better. The knee jerk is present on the left side, but is feeble. On the right side the knee reflex is obtainable only at every fourth or fifth blow of the hammer. The ankle jerk is not present on either side. There is still no plantar nor Babinski reflex. Dr. Mitchell believes, that early in this case there was an abscess between the vertebrae and the anterior wall of the pharynx. The date of the origin of the tumor is doubtful. It was too dense to have been of rapid growth. It could hardly have escaped Dr. Mackenzie's notice, and was probably of a gradual and later forma-

tion. The growth cannot be used to explain the paralysis. There was probably some toxic cause for the local palsy, but whether this fell directly on the postpharyngeal plexus, or, through the sequent abscess, damaged it, could not be decided. The great soreness of the muscles elsewhere, and the inflammation of the wrist, add to the probabilities of an acute toxic cause, primarily local.

Theisen.

Fibroma of the Nasopharynx.

CHEVALIER JACKSON, Pittsburg, Pa. (*Journal of the American Medical Association*, February 17, 1906). The patient was a boy of fourteen, with a history of increased nasal stenosis. Several pieces of so-called polyp had been removed by physicians, followed always by severe hemorrhage and no relief to breathing. The dysphagia and dyspnea was very great. There was frequent bleeding, and headache and earache were frequent and severe. The right nasal chamber was occupied by a hard tumor, the right upper maxilla was bulged outward, the velum was pressed forward on to the tongue, and back of it was a hard, smooth, glistening, vessel-streaked tumor filling the nasopharynx so completely that the finger could not palpate any but the visible portions of the growth. Diplopia and exophthalmos showed the bulging upward of the orbital plate.

Diagnosis of fibroma was made. Preliminary tracheotomy under infiltration was performed, general anesthesia in such a case being practically impossible, inasmuch as respiratory arrest is synchronous with unconsciousness. The right external carotid artery was ligated between the lingual and the superior thyroid arteries. "A small probe, in whose point a small eye had been drilled, was threaded with braided silk and passed backward through the right nasal chamber. It was insinuated between the growth and the tightly stretched velum, through which it could be felt as it worked backward. When the eye point of the probe reached the free margin of the velum, the silk was caught with forceps and drawn out the mouth for a convenient length and the probe was withdrawn from the nose. The bight of a length of snare wire was tied to the nasal end of the silk, by means of which the wire loop was drawn back through the nose until it reached the pharynx. The loop was then insinuated around the presenting portions of the growth and worked upward by traction on the ends projecting from

the nose. When the loop was felt to be taut around the base of the growth, these projecting wire ends were threaded through the straight canula of a Peters' tonsil snare by my assistant.

Closing the snare handles, the growth was cut through at one stroke. The severed tumor was then delivered with strong forceps, without lacerating the palate, though this seemed imminent, owing to the tight fit of the growth.

The bleeding was about as much as from an adenoidectomy; nothing like the welling up after the extirpation of a fibroma. Anterior and posterior plugs were placed and the tracheal canula, which had been inserted to facilitate anesthesia was removed as soon as the boy came out sufficiently. The plugs were allowed to remain forty-eight hours. No bleeding followed their removal.

The temperature rose to 101 F., but returned in two days to normal. The carotid wound healed promptly. The boy was out of bed on the third day, and was discharged well at the end of the week. No sign of pulsation was yet perceptible at the temporal artery two weeks later.

The author has ligated the external carotid artery thirty-four times without in any case an untoward result. Eight of these ligations have been preliminary to the extirpation of nasopharyngeal fibromata, and in no instance has the bleeding been serious. He does not consider an operation for true fibroma of the nasopharynx justifiable without preliminary ligation of one or both external carotid arteries.

Richards.

A True Papilloma of the Nasopharynx.

C. SCHMIDT (*Archiv. für Laryngologie und Rhinologie*, Bd. XVIII, Heft. 3, 1906). True papillomata of the nasopharynx are extremely rare, only a few cases having been reported.

Sendziak has reported a case of nasopharyngeal tumor, 6 cm. long, 5 cm. wide, and $2\frac{1}{2}$ cm. thick, which originated in the posterior end of the left inferior turbinate, filling the entire nasopharynx. Hill, Jurasz and Gourand, have also reported cases.

The following case is reported by the writer: A large, soft, reddish mass, was seen in the nasopharynx of a man, aged 47 years, who had been troubled with nasal obstruction for a long time;

The growth was removed with a ring curette, similar to the Gottstein for removing adenoid vegetations.

The microscopic examination proved the growth to be a true papilloma.

The patient was examined a year after the operation, and there had been no recurrence.

Theisen.

The Lymphatic Drainage of the Pharyngeal Tonsil.

GEORGE B. WOOD, Philadelphia (*American Journal of the Medical Sciences*, August, 1905). The lymph vessel draining the pharyngeal tonsil runs posteriorly from its lower part, penetrates the posterior pharyngeal wall, enters the retro-pharyngeal space, runs downward and outward just below the insertion of the rectus capitis anticus major and between this muscle and the bodies of the cervical vertebrae. From this point it runs obliquely downward and outward, passing beneath the sheath of the great vessels of the neck until it reaches a position almost opposite the posterior border of the sternocleidomastoid. It then turns directly outward and enters one of the small glands situated just below the tip of the mastoid along the posterior border of the sternomastoid. Hence, infections entering through the pharyngeal tonsil involve the lymph glands placed just beneath the posterior border of the sternomastoid. On account of the muscular covering of these glands it is sometimes difficult to palpate them.

Clinically the enlargement of these glands can be diagnosed by diffuse swelling over the upper part of the sternomastoid muscle, due to enlargement of the glands underneath the muscle.

Richards.

Pain In the Throat Arising from the Glands of the Floor of the Mouth.

KRETSCHMANN (*Archiv. für Laryngologic*, Bd. 19, Heft. 1). The cause of many throat pains is not uncommonly found in pathologic alteration of the salivary glands of the floor of the mouth. The alteration is usually an inflammation, less commonly a simple stasis of secretion. The diagnosis depends upon the demonstration by bilateral palpation of enlargement and sensitiveness of the organs. The most effectual treatment is found in bimanual massage of the floor of the mouth and the glands.

Goodale.

Diseases of the Pharyngeal Tonsil.

HASSLAUER (*Archiv. für Laryngologie*, Bd. 19, Heft. 1) reports a case of isolated herpetic inflammation of the pharyngeal tonsil, which showed in association with slight general disturbance marked nasal obstruction, due to swelling of the adenoid. This was deeply reddened and covered with vesicles. The process lasted 9 days, when a considerable amount of crust was evacuated from the nasopharynx. The condition resembled ordinary herpetic angina of the faucial tonsils, and probably occurs more frequently than would be supposed from the absence of recorded cases. *Goodale.*

Pharyngitis Lateralis.

W. UFFENORDE (*Archiv. für Laryngologie*, Bd. 19, Heft. 1) reviews the literature of this subject, and discusses the various etiologic factors, symptoms and methods of treatment. The paper presents an excellent résumé of our information, but gives little that is new. *Goodale.*

Remarks On Some General Infections Through the Tonsils.

ADLER (*New York Medical Journal*, March 31, 1906). In a very instructive paper on this subject Adler calls attention to a number of questions in connection with disease of tonsils which are not generally known, as for instance why dogs and cats which are wont to eat everything never suffer from tonsillitis. While it is commonly admitted that acute articular rheumatism is preceded by an attack of follicular tonsillitis it is not understood that this tonsillitis may be only very slight and transient. Indeed it can easily be overlooked unless sought for. Gurich's view that concealed foci of pus in the tonsil are the cause of acute rheumatism is alluded to. Adler believes that muscular rheumatism is also in many cases of tonsillar origin. Here, as in acute articular rheumatism, the tonsillar attack may be very slight and have disappeared several days before the outset of the muscular attack. Two cases of fatal sepsis are reported where the origin appeared to be in a slight attack of tonsillitis. A number of cases of acute nephritis have been reported. The author calls attention to the fact first shown by Leyden that in fully 75 per cent of all cases of tonsillitis there is a mild, unrecognized nephritis with albumin, and casts

present. This in the great majority of cases entirely clears up with the abatement of the tonsillitis.

In a certain number of cases, however, it remains and a chronic nephritis is the result. On these accounts Adler urges that in all cases where there are attacks of tonsillitis constantly repeated, however slight, the tonsil should be removed. This is much more important in the non-hypertrophied tonsil than in the hypertrophied variety where the violent inflammation is often a barrier to the entrance of the infection. It is not always necessary to completely remove the tonsil in such cases. Thorough destruction of the main crypts will be sufficient.

Harris.

Death from Suppurating Tonsil.

KERRISON (*N. Y. Medical Journal*, July 14, 1906). The patient was a woman of 33, with no history of previous throat trouble. She was seen on the third day of the disease. Temperature was 102, pulse 100. Examination showed the left side of the throat, including the tonsil and uvula, greatly swollen and apparently ready to burst. Fluctuation was obtained. Incision evacuated two ounces of blood and pus. After the operation the temperature fell to normal. The following day there was no improvement. Large masses of sloughing tissue were removed for the next four days. At that time she began to become cyanosed. A considerable amount of pus was again evacuated but with no lasting benefit. Tracheotomy was accordingly performed. This gave only partial relief. A general edema of the neck now developed. The next day she became unconscious. Large quantities of purulent matter came away from the nose. She died the same day.

Diagnostic and Prognostic Value of an Examination of the Throat In Pulmonary Tuberculosis.

HARLAND (*New York Medical Journal*, March 10, 1906) believes that throat symptoms such as recurring colds, continual dropping of mucus from the nasopharynx, hoarseness and cough "are in themselves suggestive of tuberculosis of the lung unless explained by obvious, other cause." He is wont to find the mucous membrane of the nose wasted and bathed in seromucus. (The significance of cough and hoarseness is well recognized. It is, however, questionable whether we are at all justified in attaching such importance to post-

nasal discharge. It is far more probable that this is a symptom of some sinus involvement. Nor is atrophy of the nasal mucosa of sufficient frequency in pulmonary tuberculosis to warrant more than the conclusion that it does occur with tuberculosis in a certain percentage of cases.—*Abstractor.*)

Harris.

IV.—LARYNX, TRACHEA AND ESOPHAGUS.

On the Disturbances of Speech In Childhood.

HAMMERSCHLAG, Vienna (*Archives of Otology*, Vol. XXXV, No. 4). The author reports the case of a child, aged 5½ years, of healthy, normal parentage, who, at the age of 14 months could articulate several words and could walk. He was taken ill with measles and had a series of convulsions lasting several days. Paralysis of the arms and legs followed the first convulsion and the rudiments of speech were lost. The hearing appeared to be as good as before. After the lapse of one year such words as "Mamma," "Papa," etc., could be pronounced, but no further progress in speech was made. The skull is slightly rachitic, the cranial nerves are unaffected. In the third year it slowly relearned to walk and to run.

Repeated examination shows that the intelligence of the child is quite good, it follows all orders, though with some hesitation.

The question is whether the motor aphasia is congenital or one acquired in early childhood. The congenital type is usually found in children whose parents have presented the same anomaly in their youth or show some defect, with lack of resistance or weakness. Consanguineous marriages likewise seem to augment the anomaly of development which causes deaf-mutism and hearing-mutism.

Aphasias well as paralyzes belonging to the not unusual complications of typhoid fever, scarlet fever, whooping cough, diphtheria, pneumonia and measles.

The author then gives abstracts of four cases described in literature of aphasia occurring after measles.

Campbell.

The Treatment of Tuberculous Laryngitis With Culture Products, With Observations Upon the Action of Specific Inoculations In the Treatment of Tuberculosis.

F. M. POTTENGER, Monrovia, Cal. (*American Journal of the American Sciences*, December, 1906). The author has found

tuberculin injections to work remarkably well in pulmonary tuberculosis, and cites a series of cases showing favorable results. He uses the watery extract of tubercle bacilli made by von Ruck, standardized so as to represent one per cent of the solid matter derived from the bodies of the bacilli. The dilution is made with normal salt solution, to which 0.4 per cent of carbolic acid has been added. This preparation represents a greater amount of soluble extract from the bodies of the bacilli than any other, and is considered superior in its immunizing properties. It is a stable preparation and can be kept for many months without deteriorating.

The larynx should be watched daily and the dosage should not be increased beyond that necessary to produce a slight reaction, nor should a second injection be given until all reaction produced by the first has disappeared. In the cases reported duration of treatment was from six months to two years.

Richards.

Examination and Surgery of Upper End of Esophagus.

H. P. MOSHER, Boston, Mass. (*Journal American Medical Association*, November 24, 1906). The most important constriction of the esophagus is at the beginning, back of the cricoid cartilage. The narrowing next in importance is at the cardiac end. A half-inch bougie should pass easily everywhere. Its failure to pass is a sign of stricture. A three-quarter-inch bougie is the largest which should be used to dilate the esophagus. The esophagus begins six inches from the incisor teeth, back of the cricoid cartilage at the sixth cervical vertebra; is ten inches long, and goes through the diaphragm at the tenth thoracic vertebra, sixteen inches from the teeth.

He tabulates one hundred and six cases of stricture of the esophagus which have been observed in the Massachusetts General Hospital. Sixteen were due to swallowing some corrosive fluid; thirty-six cases were due to carcinoma. There were fifty-seven cases of foreign bodies, which consisted of coins, false teeth, round whistles, bits of bone, common pins, buckles, safety pins, stones, peach stone, button, collar button, spoon, a pair of suspenders, and six objects not named, the two most common being coins and false teeth, there being fourteen of the former and twelve of the latter.

The author uses an esophageal speculum and various instruments devised by himself for reaching into the esophagus.

Richards.

A Case of Stenosis of the Trachea With Sudden Death By Thymus Swelling.

H. COHN (*Deutsche medicinische Wochenschrift*, August 30, 1906). There are a great many references in the literature to sudden deaths in children in which nothing was found at autopsy except an enlarged thymus. In the majority of these cases there had been no symptoms of tracheal stenosis during life. Cases in which symptoms of tracheal stenosis and disturbances of the circulation occurred during life, and in which an enlarged thymus was found after death, are very rare and have been reported only by Biebert, Siegel and Hans Cohn.

The following case is reported by the author: A child, 8 months old, had had difficulty in breathing for four weeks before seen by the author. These symptoms had been much worse for two weeks, with irregular fever, and an occasional convulsion. On examination, a well marked inspiratory dyspnea was noticed, and during expiration, swellings appeared in the vessels of the left side of the neck.

Nothing could be discovered on examining the throat, but the child had a diffuse bronchitis. On percussion, dullness was elicited over the upper part of the sternum extending to the third rib. Every 2 or 3 hours, a severe attack by dyspnea occurred, during which the child became very cyanotic. All operative measures were refused by the parents. The child was found dead in bed. At the autopsy, when the anterior chest wall was elevated, a large amount of pus was evacuated. This came from an abscess of the thymus which had been cut into. The thymus was much enlarged and had been changed into an abscess cavity. Although many authors dispute the point that in cases of "Thymus Tod," there could have been any pressure on the trachea during life, in the author's case there had been undoubtedly some compression of the trachea as well as of the blood vessels.

Theisen.

Concerning the Radical Operation for Cancer of the Larynx By Thyrotomy.

V. BRUNS (*Deutsche medicinische Wochenschrift*, September 20, 1906). Among the advances in surgery, the improvements in the technic of the radical operation for laryngeal cancer must be placed in the front rank. It is only during the

last ten or fifteen years, however, that a considerable percentage of the patients operated upon have been permanently cured. This advance is due to an early recognition of the disease when it appears in the larynx, and a proper selection of operable cases.

The first radical operation for laryngeal cancer was performed by an American, Buck, in 1851, who split the larynx and upper tracheal rings in a case of carcinoma. Two operations of this kind were performed upon the same patient, but were followed by recurrences because the operation was not thoroughly performed. During the following thirty years only a few operations were performed, and were followed by similarly bad results.

The first total extirpation of the larynx was undertaken by Billroth in 1873, although previously to that, Czerny had demonstrated upon animals that the operation was possible.

Billroth's operation, as well as fifteen other total extirpations of the larynx, performed during the next ten years, were all failures, half the patients dying as an immediate result of the operation, the other half within a year, of recurrences.

Sendziak's statistics, comprising 188 total extirpations between 1873 and 1894, showed a mortality of 44 per cent, 32 per cent of recurrences, and only 12 per cent of recoveries for at least a year. It was also shown by Sendziak that partial extirpations of the larynx offered a much better chance of success. One hundred and ten partial laryngectomies between 1876 and 1894, resulted in a mortality of 26 per cent, with 30 per cent recurrences, and 22 per cent of cures for at least a year.

Bruns speaks of the importance of the early diagnosis of laryngeal cancer, and the necessity for a strict dividing line between the intrinsic and extrinsic cancers.

His only results prove that in early cases of purely intrinsic cancer, thyrotomy is the operation of selection, and offers splendid chances of permanent cure. He has operated upon 10 cases of laryngeal cancer by thyrotomy, and seven of the patients are living, two to fifteen years after the operation.

To show the results of thyrotomy for cancer of the larynx, Bruns has collected 114 cases since 1890. He found a mortality rate in these cases of only 9 per cent, with 22 per cent of recurrences, and 48 per cent of cures for at least a year.

In conclusion, the author states, that endolaryngeal operations for cancer should not be performed, because they not only do not benefit the patient in any way, but are really harmful, because they may set up a more rapid growth of the cancer.

Theisen.

V.—MISCELLANEOUS.

Acute and Chronic Suppuration of the Ear and Nose the Direct Cause for Facial Erysipelas.

CULLEN F. WELTY, San Francisco (*Journal American Medical Association*, December 22, 1906). Erysipelas of the face is due to direct infection from a contaminated field of pure or mixed infections of streptococci. In the majority of these cases the infection can be demonstrated, and in those that are not demonstrated it is probably present but not found. Epidemics of erysipelas are nothing more than direct wound infection through surgeons or nurses, and so-called idiopathic erysipelas is a misnomer. The erysipelas is especially confined to the face because it is nearest the seat of infection; because the secretion of pus produces an abrasion of the mucous membrane or skin and then an inoculation follows. It may occur from the handkerchief, but is more often from the finger.

Richards.

Koplik Spots: Their Relation and Interest to Laryngologists.

H. C. LANGWORTHY, Dubuque, Iowa (*Medical Record*, October 20, 1906). In most cases measles can be diagnosed thirty-six hours before the cutaneous eruption. The characteristic spot is a tiny, pearly white one on a red background of mucous membrane, and appears earliest on the mucous membrane near the angle of the mouth and the area covered by the gums. Nose and throat specialists should be on the lookout for this, especially in institutions, as it may be possible to forestall an epidemic by a timely diagnosis.

Richards.

Aural and Nasal Examinations of School Children.

D. HOWARD WALKER, Boston, Mass. (*Boston Medical and Surgical Journal*, December 13, 1906). The hearing was tested by a whispered voice which could be heard by the average normal ear at a distance of twenty-five feet, and a spoken

voice with thirty-five feet as the normal limit. Numbers and short sentences were used, the distance which the voice could be heard by the normal ear being used as the denominator and the actual distance heard as the numerator.

Adenoids were determined by the hearing test, the condition of the drum membranes, and the general facial expression.

Of 289 children examined 23 per cent had two-thirds of normal hearing or less. There were ten hypertrophied turbinates; thirty-five septal spurs; eight deviated septums; 89 or 30 per cent had adenoids; 63 or 21 per cent had hypertrophied tonsils; fifteen showed the results of chronic suppuration of the middle ear, and three had active suppuration.

In comparing the hearing tests with the scholarship it was found that 17 per cent of those marked with the grade of "excellent," 20 per cent of those marked "good," 30 per cent of those marked "fair," 50 per cent of those marked "unsatisfactory," and 42 per cent of those marked "poor" showed diminished hearing.

Richards.

BOOK NOTICES.

By BEAMAN DOUGLASS, M. D., Professor of Diseases of the Nose and Throat, in the New York Post-Graduate Medical School and Hospital, 1906. F. A. Davis Company, Philadelphia.

The development of technique, which has characterized nasal surgery during the past decade, has naturally been followed by the appearance of publications, monographs and papers in which this technique is described.

This is the first attempt in English, however, to include so large a portion of nose and throat surgery in a single work. Dr. Douglass has certainly presented the subject in a most admirable way, building up the details of the surgery from well-illustrated descriptions of the anatomy of the parts. The reproductions are made from original specimens, in the main, which are so arranged as to show the important factors in the various operations.

The author might have made an improvement if he adhered strictly to the established anatomic nomenclature, or at least if he had used uniformly English or Latin terms. Thus, if *processus uncinatus* and words of that type are employed, it would be better to designate other structures in Latin, as *sinus sphenoidalis*, *sinus maxillaris*, etc. Then again, terms such as *turbinal* and *turbinate* should hardly be used to apply to the same structure.

The submucous resection of the septum was evidently too recent a procedure for any extended attention, likewise bronchoscopy, etc.; this is unfortunate as it leaves a large gap in the subject.

The text throughout keeps well in view the object of the work; the author is to be congratulated in that he has been successful in presenting a subject so complex in such a simple, instructive way. However extensive one's knowledge of nasal surgery may be, he can learn much from this little book.

The Surgical Treatment of Chronic Suppuration of the Middle Ear and Mastoid.

By SEYMOUR OPPENHEIMER, M. D. Published by P. Blakiston's Son & Co., Philadelphia.

Perhaps the most striking feature of this work is its thoroughness. Each step of the treatment is treated carefully and

in detail, abounding in little suggestions of things which are usually taken for granted, but which are practically unknown to the beginner and are acquired only as the result of much time and sifting of methods. The text contains 46 unusually well done half-tone plates, engraved from original drawing of dissections made under the direction of the author.

The trend of the work is conservative, as evidenced by the fact that almost one-half of the book deals with treatment through the external auditory meatus.

Part II deals with the subject of operations upon the mastoid and with all the phases with the exception of the intracranial complications of middle ear suppuration which have been omitted.

Taken altogether, the work is one of the most valuable that has thus far appeared on the subject.

character, but which fall to the lot of an otologist, such as those Koplik

Operative Otology; Surgical Pathology and Treatment of Diseases of the Ear.

By CLARENCE JOHN BLAKE, M. D., Professor of Otology in Harvard University, and HENRY OTTRIDGE REIK, Associate in Ophthalmology and Otology, Johns Hopkins University, 1906. D. Appleton & Co.

There is something very pleasing and satisfying in this little book of 360 pages, which must be commended by everyone who reads it. There is a terseness of expression without expense of clearness and a fulness of explanation which stops short of prolixity. A short sketch of the anatomy of the ear and of aseptic technique precedes the discussion of the individual conditions subject to surgical treatment.

The description of the various mastoid operations is in keeping with that of other operations, clear and concise, and yet thoroughly expressive of its most modern type. The blood-clot dressing is recommended; it is stated that, "in the event of failure to organize, the blood clot breaks down usually either wholly or in part within forty-eight hours, in proportion to the extent of the infection, and there results the condition of an open wound healing by granulation tissue which is to be treated by the usual method of packing and cleansing.

Operations are also described which are not strictly aural in character, but which fall to the lot of an otologist, such as that for cervical abscess, ligation of the jugular, adenoids, subcutaneous and intravenous infusions and lumbar puncture.

ANNALS
OF
OTOLOGY, RHINOLOGY
AND
LARYNGOLOGY.

VOL. XVI.

JUNE, 1907.

No. 2.

XX.

THE TREATMENT OF FOREIGN BODIES IN THE
RESPIRATORY TRACT AND ESOPHAGUS.*

AN ADDRESS DELIVERED BEFORE THE AMERICAN LARYNGOLOGICAL,
RHINOLOGICAL AND OTOLOGICAL SOCIETY, AT THE THIR-
TEENTH ANNUAL MEETING HELD AT NEW YORK
CITY, MAY 30, 1907.

BY PROF. GUSTAV KILLIAN,

FREIBURG IN BREISGAU.

GENTLEMEN :

The invitation of your President to deliver an address on the treatment of foreign bodies in the air-passages and esophagus is accepted with great pleasure, inasmuch as it relates to a method of examination in behalf of which I have, for the past ten years, been making an earnest propaganda, in the desire to benefit the afflicted by its general dissemination.

*Translated by HANAU W. LOEB, M. D., St. Louis.

RESPIRATORY TRACT.

I need not say much with reference to the upper respiratory tract. We are often called upon to treat foreign bodies in the nasal cavities, especially in children. As a rule, they are buttons, beads, etc., made out of various materials, cherry-seeds, beans, peas, and occasionally a forgotten cotton tampon. Nasal calculi also belong to this class.

Once I was called upon to remove a free osteoma, of the size of a hazel-nut, which had been left in the nasal cavity after an operation performed the year before, and which rolled to and fro with the movement of the head. It was incomprehensible how the patient could endure the condition so long. Another case was that of a child who accidentally ran a splinter into his nose. Another infant was brought to me suffering from very high fever, bad smelling nasal discharge, and swollen glands, resulting from a paper plug which his sister had stuck into his nose some time before. That the severe clinical picture depended upon this was shown by its disappearance after removal. Finally I must mention a case in which a wooden plug, as thick and long as the little finger, was shot through the maxillary sinus, passing into the nose and perforating the septum.

Foreign bodies in the nasal cavities in children are generally found in the vicinity of the vestibule, if no unskillful efforts at removal have been made. In one of my cases, the ethmoid bone was penetrated as far as the orbit in the fruitless search for the foreign body. Inflammation symptoms may follow such efforts, which may make the discovery of a foreign body very difficult.

The simplest and the most common method of removal is to introduce a thick nasal probe, bent forward, beyond the foreign body, and then draw it from behind forward and remove it. The little patient often, involuntarily, assists in this by moving the head backwards. A strong pair of toothed forceps is the best instrument to use for large impacted foreign bodies. When necessary, a great amount of strength may be used with this instrument, so that the foreign body may be extracted with certainty.

So far as foreign bodies in the accessory cavities of the nose are concerned, the maxillary sinus is the principal site. They are generally trochars and drainage tubes which are shoved into artificial openings. Occasionally, roots of teeth or por-

tions of bone, remaining after operation, are found. I have often succeeded in locating and extracting a drainage tube through an alveolar fistula by means of a nasal speculum. I have occasionally removed such objects while performing the radical operation.

Foreign bodies are seldom found in the epipharynx. I was once called upon to remove a collar button which I had drawn out of the larynx, under narcosis, with the head hanging downwards; it slipped from me and fell into the epipharynx. Its removal was more difficult than I had anticipated.

In the mesopharynx and hypopharynx, fishbones are most frequent. They are found in the region of the tonsils, sometimes at the base of the tongue, and rarely in deeper positions. They are readily removed with forceps. Pieces of bone may be lodged in the sinus pyriformis. I was called upon to remove a splinter of bone, sharp at both ends, which was stuck in this place, causing the patient to have severe symptoms, though it was not discovered by the physician in charge. In another case, deep pharyngeal and laryngeal abscesses, resulting from a chicken-bone sticking in the sinus pyriformis, were spontaneously evacuated and cured.

Foreign bodies in the larynx constitute an extensive and interesting chapter of our subject, but are not so common as generally supposed. As a rule the foreign body immediately travels further down. Sharp and uneven objects are most apt to be caught in the larynx: needles, fishbones, bone splinters, shell of nuts. Once I saw half of a dental plate lying there.

The laryngoscopic method of extraction has, in this particular, achieved a great triumph. It may be called the normal method for adults, as long as the foreign body is not firmly wedged in. In children, the removal through the agency of the laryngoscope is very difficult, and though it may be successful under narcosis, still our old time technic has its limitations. It entirely fails when the foreign body is tightly wedged in. The smaller the child, the greater the difficulty. It was formerly necessary to take refuge in laryngofissure, but now we have the additional advantage of direct laryngoscopy, which makes laryngofissure superfluous in the majority of cases. In all doubtful cases in children, I should recommend the practice of entering directly with the tube, under narcosis, and with the head hanging down.

The number of cases treated so far in this way is small (Denker, Garel, Guisez, De Stella, G. Killian), but it justifies the greatest hope for the future. I recommend you to use my tipped tube spatula. The base of the tongue is drawn forward with it and the epiglottis and inner surface of the larynx are cocaineized. Under narcosis, this is done with the head hanging down. The spatula is then passed over the epiglottis which is thus drawn forward. By suitable illumination with an electric forehead lamp (Kirstein's) or with an electric extension lamp, a beautiful view into the larynx is obtained not only as far as the vocal bands, but also into the subglottic space and deeper, provided the local and general anesthesia is sufficient. Foreign bodies can be readily seen and removed with suitable forceps. If the process is made difficult by the mucus that collects, this is removed by my pump (which has lately been modified by my assistant, Brünings). Anyone who has had experience can, under certain conditions, avoid tracheotomy, in recent cases, if the danger of suffocation is not too great, by rapid performance of direct laryngoscopy, as Denker succeeded in doing in one case.

FOREIGN BODIES IN THE TRACHEA AND BRONCHI.

I come now to the treatment of foreign bodies in the trachea and bronchi. In these, the direct method has the field entirely. The results have been extraordinarily successful. Since 1897, when I reported my first case in the *Münchener med. Wochenschrift*, until the end of March this year, 164 cases have been reported. (I count only the cases in which a foreign body was actually present.) To my certain knowledge, however, there are a large number of cases still unreported, so that altogether there are 200 or more. Practitioners have made themselves familiar with the new method in most civilized lands. It was very early and ardently employed in the United States.

In order to reach a foreign body in the trachea or bronchi, it is necessary to introduce a tube of proper caliber and proper length through the glottis, that is, to perform upper direct tracheo-bronchoscopy.

The tube should be chosen just wide enough to pass smoothly through the larynx. In adults, its caliber should be from 9 to 14 mm., and in children, as a rule, it must be reduced to

7 mm. Very small children require tubes of 5 mm. or less in diameter. The length of the tube should correspond, in adults from 30 to 40 cm., in children from 20 to 30 cm., or even less. The actual measurement for the removal is to be taken from the upper row of teeth to the point where the foreign body lies, with the head bent back. This is easily ascertained before the operation.

The variations in the age of patients, the size of their bodies, the width of the larynges, and the location of the foreign bodies are so great that a great many different tubes must be kept on hand. Furthermore, it sometimes happens that a change from a longer or shorter tube is necessary during the operation. In order to secure a desirable simplicity in this particular, I have effected the lengthening of the tube by introducing secondary tubes. The sliding tubes of Brünings, which I now show, have been constructed accordingly and are very efficient for this purpose. They are composed essentially of a tube spatula, through which a second tube may be pushed as far as desired. An equipment of five or six of these tubes is sufficient for all adult cases. A regulator, attached to the lateral wall of the tube spatula, controls the introduction of the tube. The tube spatula is readily inserted and passed through the glottis. We can easily introduce the sliding tube any distance from the middle of the trachea to the bronchi of the lower lobes. Two lateral openings in the sliding tube renders respiration easier. They are especially necessary when it is desired to introduce a tube, filling the larynx, into a branch bronchus, where the lung tissue is not sufficient for the purpose of respiration (shut off by foreign body or tissue changes).

Good local and general anesthesia must be secured in order to introduce such a tube into the deeper air passages. A hypodermic of 0.01 to 0.02 grams of morphin is given to adults a half hour before; in children, the internal administration of codein, five to fifteen drops of a one per cent solution, according to age, will be advantageous.

When no narcosis is to be employed, the larynx and trachea are cocainized by the aid of a mirror while the patient is in the sitting position. In this connection, the epiglottis may be pulled so far forward that a cocain applicator, extended perpendicularly, introduced through the mouth, with the aid of a mirror, will glide over the posterior wall of the

larynx into the deeper parts. This procedure may also be undertaken by direct laryngoscopy or by the aid of the finger. Wherever I use general narcosis, I cocaine only after it is sufficiently deep. Then the mouth speculum is introduced, the tongue seized with the forceps and pulled forward and cocaineization is made by means of the tipped tube spatula, as before stated.

It is best, in performing direct bronchoscopy for the removal of foreign bodies, to have the patient in the recumbent position, whether or not a general anesthetic is used. In this way all the disturbances, so easily called forth by the accumulated saliva and mucus, are suppressed.

The patient should be placed so that the foreign bodies lie at the highest level and the head at the lowest, since in this way the clearest field of view is obtained. Generally, I have the patient lie on his back, but lately I have begun to place him on his side, which seems to be the most advantageous position.

It is a great mistake to bend the head too far back at the introduction of the tube spatula. One should begin with a moderate bending of the head backwards and increase this during the procedure as far as occasion demands. The tube spatula is introduced through the angle of the mouth from the opposite side, if the situation of the foreign body is known. The epiglottis, arytenoids and vocal bands are sought and the instrument is then passed between them into the trachea. If the cocaineization has been sufficient, there will be no interference at the glottis.

After the deeper portions and the bronchus especially have been carefully cocaineized (without pushing the foreign body deeper), the sliding tube may be introduced first to the bifurcation and then into the affected bronchus. It should be advanced until it reaches the neighborhood of the foreign body which is often covered with mucus and granulations or but slightly visible. It is then necessary to suck up the secretion with the pump. The granulations must be carefully treated so that no hemorrhage from in front occurs.

If the foreign body does not lie in a position where it may be easily removed, the neighboring mucous membrane should be made anesthetic by the application of cocaine on a small cotton carrier or by a cocaine spray (weak solution) inasmuch as this region is very hyperesthetic. The slightest movement

of the foreign body causes severe paroxysms of coughing. The greatest difficulty results from neglecting to cocaineize in this way, for it is clear that everything else has been made anesthetic, especially the whole passageway to the foreign body, except the mucous membrane directly adjoining.

The procedure is much simpler in tracheotomized patients whether tracheotomy has already been performed or whether we ourselves have been forced to perform it on account of the severe dyspnea, or must perform it because the extraction cannot be accomplished by the upper method.

Lower direct tracheo-bronchoscopy seldom requires general anesthesia. Simple cocaineization of the tracheo-bronchial mucosa is sufficient. Larger and shorter tubes may be used. For the reason already stated, it is best to have the patient in the recumbent position. As a rule, Brünings' new instruments are the best adapted for lower tracheo-bronchoscopy.

The extraction of foreign bodies is a subject in itself. No general rule can be laid down, but each case is a law unto itself. It depends upon the character of the foreign body, its position and the condition of the neighboring structures. The whole mechanism of extraction often requires thorough deliberation and experience is most advantageous.

I have thought that it would be of most service to you if I gave you the results not only of my own methods, but also those of others, and even those of prebronchoscopic times. I have, therefore, thoroughly studied the literature and I give you the results condensed.

We will pursue the subject better if we divide foreign bodies into groups and establish the best and most certain methods of extraction for each. In this way the novice may quickly obtain the most complete information regarding a given case and may guard himself against serious mistakes. Above all, it will be of value to him to accustom himself to the proper use of the most reliable instruments for extraction.

Foreign bodies are best divided into two groups from the standpoint of the extraction (this is practical and most important).

I. Hard.

II. Not hard.

HARD BODIES.

The hard variety have in common a definite size, form and surface quality. I first separate those which extend mainly in

one direction: Needles, fishbones, nails, screws, and steel pens. Then follow those which are extended in two dimensions: Flat bodies like coins, pebbles.

Bodies with three dimensions; with smooth surface such as beads, cherry-stones, coffee-beans; those with uneven surface and contour, as prune-stones, pieces of bone, etc.; those with irregular form such as teeth, pieces of metal, metallic objects of different types but typical form, and collar buttons. I include artificial dentures in this group.

Hollow bodies of different materials and of the widest variety constitute a separate group.

BODIES NOT HARD.

Bodies with consistency from wood to cork have an intermediate place. Fruit seeds, which are easily broken, are placed in an individual class, likewise the semi-soft vegetable seeds. Then come the really soft bodies, which must be considered individually, for instance, cereal spikes and especially seeds which are likely to swell (beans, etc.).

Needles.—Sprengel, 1; G. Killian, 2; Gare', 1; Ingals, 2; Coolidge, 2; Gottstein, 1; Lombard, 1; Elsberg, 1; Brokaw, 1—12 cases.

Those which were inspired were usually of the sewing-needle variety, though in one instance it was a Pravaz syringe needle. The patients, as a rule, are adults, which makes the removal much easier. As needles cause only slight pulmonary symptoms, there is no necessity for immediate extraction, so that if success does not attend first efforts there is no special danger in waiting and the necessary procedure may be repeated.

It is a very valuable circumstance that the Röntgen picture is usually positive, showing the exact site and position of the needle. We can, as a rule, be certain that the head of the needle lies downward and that the point sticks upward and sidewise. Its fixation, as a rule, is only slight. The point does not simply stick into the mucosa; it is usually surrounded by granulations or has caused a small abscess. As there are only slight disturbances of the bronchial mucous membrane, the examination will not be made difficult by mucus; on the other hand, we must remember that there is a great hyperesthesia in the neighborhood of the needle which must be overcome by careful cocaineization.

Needle cases are more suitable for upper bronchoscopy than any others, for the reasons given. Lower bronchoscopy is required only in extraordinary cases. Our report of cases gives no proper light as to the future, because tracheotomy has been too frequently performed, since upper bronchoscopy was not sufficiently trusted by operators.

My first case certainly constitutes an exception. I made a sincere effort to find the needle by upper bronchoscopy without result, and likewise lower bronchoscopy, although the X-ray picture was positive. Ten years had intervened since the needle had entered the trachea, and therefore it might have been imbedded anywhere in the lung tissue.

When the needle is brought into good view and the position of the point ascertained by means of the tube, it is easily grasped near its point by von Eicken's right angled short-jawed forceps and freed from the bronchial wall by a slight backward motion and then drawn outward through the tube. If the forceps slips off the smooth metal, it may be covered with a thin rubber pad. The needle may also be freed from the bronchial wall by pressure of the rim of the tube over the place where the needle has penetrated.

All the cases cited above were followed by good result; in but one case (Lombard) was the cure delayed by pneumonia.

Fishbones generally are caught higher up and seldom reach the trachea or bronchi. Only two cases were observed by means of the bronchoscope, one by my brother and the other by Gottstein. Both were in young children, $3\frac{1}{2}$ and 1 year. In the first case, upper bronchoscopy, under general anesthesia, was of excellent service. The bone was readily removed with a hook and the child rapidly recovered. Tracheotomy was necessary in the second, on account of threatening suffocation. The bone, which was subglottic at the beginning, was found by means of lower direct tracheoscopy to be in the trachea, from which it was easily removed.

Nails. (Cases of Lindt, H. v. Schrötter, v. Mikulicz, Coolidge, Helferich, Neumeyer, Guisez.)

We have in these cases to act, in general, as with needles, as the conditions are exactly the same. The head lies, as in the other instance, generally below, easily demonstrated by the Röntgen picture. They are generally found deep in the right bronchus.

The patient is asked to show a nail similar to the one in the bronchus, for the purpose of orientation. As a rule, upper bronchoscopy and von Eicken's forceps will be successful. The latter has the value of drawing from the side so that one may see what is being done. Of course good results may be obtained with any suitable straight forceps. The electro-magnet is of use only when the nail is very small and deeply lodged, as happened in two cases. A rod shaped electro-magnet is necessary so as to permit its introduction deep into the tube.

Steel Pens (Cases of Borchardt and Gottstein) are to be treated in a similar way.

Coins (Cases of Killian-Worms, Coolidge, Guisez, 3) have been found in the deeper air passages only in adults. They are apparently too large for children and are therefore usually swallowed. Coins are flat bodies and lie usually diagonal to the bronchial lumen. The current of inspired and expired air apparently seeks to keep as broad a passageway as possible both from above and below by the side of the easily moved coin. Our extraction instruments in the form of forceps are particularly useful in drawing out diagonally placed flat bodies. It is therefore to be expected that good results will follow the use of upper bronchoscopy with proper technic, as was demonstrated in the cases above cited.

Pebbles. (Cases of G. Killian, von Eicken, Kahn, Pieniazek.) The inspiration of pebbles is a specialty of children from 2 to 6 years of age, who like to put such things in the mouth. They are partial to flat, smooth stones which require the same method of extraction as coins. Smooth stones present, however, greater difficulties. The pebbles selected by children are generally so large that they cannot fall deep into the bronchus, but remain at its entrance and often partially in the trachea. They do not cause irritation and, therefore, there are little disturbances from secretion; accordingly, they may be readily reached and removed with my bean forceps, by means of tracheoscopy under general anesthesia. All the cases known up to the present time have been rapidly and successfully relieved (from two hours to one day after inspiration). Those treated by means of upper bronchoscopy were able to go home after the effects of the anesthesia had disappeared.

Glass Beads, Cherry-Stones, Coffee-Beans.—Noltenius, Jackson, and Pasteur observed cases in which glass beads,

glass buttons, and shoe buttons were found in the deeper air passages. These bodies have a peculiar property. They continue movable for a longer time in the trachea, and are only occasionally impacted in the right and left bronchus. They are readily coughed up, but they may be retained for a long time. Only in young children is coughing up through the larynx not so easy. This may, perhaps, be encouraged by cocainization in the subglottic space. If the bead remains, help may be quickly obtained by pushing it downwards with the applicator.

We must remember that, when performing upper bronchoscopy, the bead may be coughed up into the tube, for which reason a wide tube should be used. It is not easy to grasp a moving body in the trachea, so it is best to try to fix it in the neighborhood of the bifurcation and to grasp it there with forceps.

The same applies to cherry-stones (case of Hinsberg) and hard pills (Siebenmann). Coffee-beans (cases of Neumeyer and Fletcher Ingals) are very light and are therefore still more movable than the above, so that they may be coughed up earlier. Upper bronchoscopy is very well adapted for their removal if only a proper instrument can be used. Besides the bean forceps, a fine, sharp hook may be of service.

Prune Stones differ from the preceding by their oval shape, pointed ends, and rough surface, which are favorable for the grasp of the extraction instruments. Three cases have so far been observed by Siebenmann, Kausch and Lafite, but we may expect that sooner or later we will meet with more such cases, as the extraction of prune stones, according to reports, has been quite frequent. They occur in all ages of life. In children, they do not attain any great depth, on account of their size. They remain in the trachea and in the neighborhood of the opening of the main bronchi. This is important to know, as the Röntgen picture is negative.

The chances for upper bronchoscopy are therefore good, as the stone lies diagonally (like coins), leaving on both sides a free space for different kinds of forceps.

Other fruit stones are occasionally found, for instance, the apricot stone in Pieniazek's case.

Pieces of Bone are the commonest foreign bodies observed through the medium of bronchoscopy. There are no less than 31 cases reported. I myself have seen six cases, Kümmell,

Spiess 1, v. Schrötter 3, Gottstein 1, Hug 1, Neumeyer 1, Just 1, Schwytzer 1, Siebenmann 1, Moure 2, Meyer 1, Kob 1, Pauns 1, Nowotny 1, Hinsberg 1, Henrici 1, Chiari 1, Garel 1, Lehr 1, Lins 1, Pauner 1, Winkler 1, von Eicken 1.

Pieces of bone are much more often inspired by adults than by children (three-fourths of the cases), and of these, mainly those above forty (half the cases). They are seldom found in the trachea, but mainly in the bronchi, especially on the right side. The trachea is more commonly the site in children.

Severe lung changes develop only occasionally directly following aspiration. On the other hand, they do not wait very long if the bone is not removed. The pieces of bone have mostly a rough surface and sharp edges and corners, become impacted and scratch the mucosa. From the small wounds, granulations spring up which enclose the piece of bone, give rise to collections of mucus and pus and destructive processes and help to shut off the dependent lung tissue. Later, putrid bronchitis, bronchiectasis, pulmonary abscess and pulmonary gangrene may appear. The secretion from the lungs under such circumstances is very abundant, making bronchoscopy and extraction very difficult. Besides this, there is a high grade of hyperesthesia of the mucosa in the neighborhood of the foreign body. It is, on this account, important to remove the inspired piece of bone as soon as possible. So far, three-fourths of the cases have been old ones.

The pieces are, as a rule, of flat shape and are 14 to 15 mm. long by 8 to 9 mm. wide. They are so situated that their long diameter corresponds to the axis of the respective bronchus and their horizontal diameter lies across the bronchus. On account of their flat form they resemble coins and are therefore easy to grasp. The granulations sometimes hide the location so that the diagonal position cannot be well made out. It is therefore necessary to clean the field with the pump in order to ascertain clearly the position of the bone. A diagonally placed bone can be easily removed with any kind of forceps.

Cubical Bodies are more difficult to remove. The bronchus may be so filled that no instrument can pass by, except perhaps a fine, sharp hook. For such cases, my assistant, Dr. Brünings has constructed, under my direction, a sharp hook forceps which catches very well, even when only a small portion of the bone can be grasped. It worked very well in the

very first case and it will doubtless be used with rapid result in many other upper bronchoscopies.

The extraction with lower bronchoscopy is naturally much easier. We make use of it when the upper is not available.

The present collection of cases does not give as yet a proper conception of the performance of bronchoscopy since there are too many technically incomplete cases included under the head.

Teeth.—Inasmuch as we have to deal with carious teeth and tooth fragments, the lung results are more severe than in the case of bones which have been sterilized by cooking. When a carious tooth gets into the lungs, severe pulmonary symptoms rapidly follow. Of 14 cases of earlier times, eight died of lung complications, one of which was from actinomycosis. Three of those who recovered went through very severe lung complications.

Such an inspired tooth, therefore, must be removed without delay. Pieniazek removed one from a patient, 40 years of age, by lower bronchoscopy, eight days after the accident. Pneumonic symptoms had already appeared in the right lower lobe, which progressed in spite of the removal, so that recovery was delayed for some time.

Pieces of Metal and Metallic Objects.—Cases of Neumeyer, Paterson, Pieniazek (3), Helfferich, J. Killian, Gottstein, H. v. Schrötter, Kümmler, Fletcher Ingals, Hajek, 12 cases in all, including many children, especially the larger ones who like to play with such things. The special forms of such foreign bodies make the attempts at removal very difficult. Upper bronchoscopy is on this account not always successful. In one instance, the foreign body (a garter clasp) was too large and could not be drawn through the larynx. Inasmuch as the metallic bodies cause no acute lung symptoms, there is time to use upper bronchoscopy several times before the method is given up. Extraction occasionally necessitates special instruments, depending on the form of the foreign body. Brünings' lock forceps, covered with rubber, are suggested for smooth metallic bodies.

Shirt and Collar Buttons are particularly difficult to remove from the deeper air passages especially if the flat part lies above. If it lies diagonally in the bronchus, that is, if its neck is diagonal, it may be readily grasped and extracted, best with a hook. This is placed around the neck and the button is pressed against the end of the tube so that they may be all

removed together (G. Killian, Fletcher Ingals). But when the plate lies above, it is very difficult to pass by the button. It fills the lumen of the bronchus and is covered up by the swelling of the mucous membrane. If the button remains for a longer time, granulations will spring up and, in course of time, decided stenosis may follow. In two cases of the last-named kind (Spiess, Hoffmeister), extraction was impossible. Hoffmeister's case developed pneumonia. Both cases died. I have had the good fortune to remove collar buttons three times, once with upper bronchoscopy, twice with lower. In the last two cases, the requirements for extraction were too great for upper bronchoscopy. In each case, the plate lay above and a great amount of secretion prevented its removal. The first patient, an eighteen-year-old boy, suffered from extensive bronchiectasis; he died from this condition six months later. The other patient was a boy ten years of age. The button, which was made of porcelain, caused severe pulmonary symptoms and indicated immediate extraction. Much time could not be spent with upper bronchoscopy. Lister's hook was in both cases the only instrument which I could use. It was possible to pass by the plate and grasp the button at the neck and thus extract it.

One of my students, Cuthbert Morton, has lately devised a spear-hook by which the plate may be grasped at its edge.

Artificial Dentures, as a rule, are too large to enter the air passages, but if they do, the larynx holds them back. They seldom pass entirely into the deep portion, and then into the left bronchus as in Wild's case. This was a plate with two teeth. It was observed eleven days after the accident by means of upper bronchoscopy and as it was too large for certain removal through the larynx, it was extracted by forceps, by means of lower bronchoscopy.

Hollow Bodies.—Fragments of canulae (Pieniazek, 3 cases; Coolidge, Neumeyer, Narath, each had one case). Hollow bodies of moderate size, pencils and the like (Thost, Neumeyer, Englemann, G. Killian). Small hollow bodies, tin whistles, etc. (G. Killian, Claoue, Guisez). Sundries (Guisez, Durewitz, Kob).

After tracheotomy, the canula sometimes breaks off from the plate and falls down into the trachea or even into the right bronchus, seldom into the left. There is difficulty in extracting the canula by forceps and lower tracheoscopy and bringing it

through the tracheotomy wound. It is best to increase this wound in size. Hooks may be used instead of forceps, if it is the outer tube with an opening in it. The hook is inserted in the opening. In one case, under general anesthesia, respiration ceased, the foreign body having completely shut off the air. The operator (Pieniazek) had the presence of mind and wisdom, in this critical situation, to push the canula down into the right bronchus, by which breathing became at once free. Later, the extraction was easy. Penholders, pencil cases and such hollow bodies, particularly if they are small, as in my case of tin whistle, may cause decided difficulty, especially as they occur in children from 4 to 8 years of age. They are aspired into the bronchi and may be easily seen in Röntgen pictures. Inasmuch as they are smooth metallic bodies, they occasion slight symptoms and do not cause any severe infection of the lungs. The symptoms are naturally milder when the air can pass through the tube.

The foreign bodies may well be reached by upper bronchoscopy, as happened in four out of six cases (G. Killian 2, Neumeyer, Guisez). They may be grasped at the edge with forceps whereby one branch is pushed into the opening and the other between the wall of the foreign body and that of the bronchus. If the edge of the foreign body is covered with swollen bronchial mucosa, it will be better to use my hollow body forceps, which, after being pushed in the opening, spread their branches in the hollow body and give a reliable hold. I have an instrument for narrow hollow bodies that is constructed as fine as a tipped sound. When the tip of the sound is pulled back, the four arms spread out.

II.—FOREIGN BODIES WHICH ARE NOT HARD.

There is an intermediate form, with a consistency of wood and cork. I include nut-shells in this class, altogether 9 cases (Voutilini, Schmidt, Neumeyer, Pieniazek 2, d'Astros, Kausch, Cavaillon, Munasse).

As far as the technic is concerned, upper and lower tracheo-bronchoscopy may be used to remove the foreign body. Extraction forceps are satisfactory. Those that break easily, such as nut kernels, must be removed with great care. (Cases of Chiari, Hinsberg, Kob, von Eicken, Nishiyama.) If they are broken with the forceps, a number of foreign bodies are made out of the one, a danger whose effect will be lessened by the

fact that the smaller portion may be more easily coughed up. Still one must not depend too much on this, as complication may result, especially in small children. Von Eicken's case is noteworthy. In this, a child of 14 months, a high grade of interstitial emphysema developed very rapidly, after he was unable to find the foreign body by upper bronchoscopy. Tracheotomy did not improve the emphysema, and the child died during the night. In order to prevent the breaking of the kernels, it is best to enter carefully with opened bean forceps and to grasp the whole kernel at once, and extract it at once without pressure..

Seeds of Melons, Oranges, Dates, etc.—(Yankauer, Paunz, Panner, Guisez, Saint Germain, Thomas Clayter). Our new sharp hook forceps which I have recommended for pieces of bone is just right for such fruit seeds, for they always clutch the foreign body tight.

There is a case of H. v. Schrötter to be mentioned in which pepper-corns had been inspired. These were very irritating to the bronchial mucosa and called for immediate removal. Schrötter's case, a child 11 months old, died one day later in spite of tracheotomy and lower bronchoscopy. It was impossible to locate the two pepper-corns, one of which was found on autopsy in the bronchus of the right lower lobe and one in the mouth of the bronchus of the right middle lobe.

Many cases are reported involving soft and coherent bodies, such as cotton, pieces of meat, quill of an arrow, down. (E. Mayer, Neumeyer, Hirschland, Bodmer, G. Killian.) There are, however, soft but not coherent objects, as pieces of fruit, pieces of turnip, plant leaves, etc. (G. Killian, Gottstein, Nowotny, Jackson.) These things may be serious for the moment, if they are of large size; otherwise they are coughed up in parts or in toto. The extraction with forceps offers no difficulty for coherent bodies; such as are not coherent must be removed with bean forceps.

Cereal Spikes. (Cases of Pieniazek and Neumeyer.) I have collected twenty-six cases in the pre-bronchoscopic period. A consideration of these cases teaches that cereal spikes are foreign bodies which are of a very individual type. They do not remain in the position in the trachea or bronchus in which they were placed by inspiration, but gradually wander deeper, so that it is always less and less easy to seize them.

They can, on this account, seldom be removed. They cause pulmonary complications and may finally be thrown out peripherally with the pus, if they are not already coughed up whole or in part. One-fourth of the patients died.

The two cases observed under bronchoscopy were not much better on that account. One, a child of eight months, died in spite of the extraction; in the other, the object was not seen and the expulsion was not noted.

We should treat these cases as soon as possible. In making the extraction, it is to be understood that the spikes have their points directed upwards—i. e., against the line of extraction. They can be completely removed only if they are completely surrounded by a properly formed fenestrated forceps.

Expansible Fruit-kernels, Beans, Etc. Bean cases (Pieniazek, 3; G. Killian, 2; Nahrkorn, 2; Kümmel, Harrington, von Eicken, Gottstein, Siebenmann, Kausch, 2; E. Mayer, New York, Nowotny, Pommering, Kahler; eighteen cases in all). In addition, three similar cases (H. von Schrötter, Paunz, Fletcher Ingals). Beans are the most commonly inspired foreign bodies. Over 100 cases were reported in pre-bronchoscopic times. The number under bronchoscopic examinations reaches eighteen cases. We must, therefore, be assured that we shall have much more to do with these serious foreign bodies, involving small children, generally.

Beans are at the beginning movable, but become fixed as soon as they swell, in the opening of the bronchus, much more frequently in the right than in the left. By swelling, they shut off the dependent lung tissue and as a rule the whole lobe. Bronchitic secretion collects below them and pneumonia symptoms with high fever and extensive atelectasis soon develop. Thirty-nine per cent of former cases die.

As these complications occur very soon, indeed, in the course of a few days, we cannot operate too promptly upon such a case. In addition we meet with the very unpleasant changes caused by the swelling, which makes the bean soft and crumbling.

So far there has been little satisfaction with upper bronchoscopy. In only two cases was it in some measure successful, and once suffocation followed because one-half of the bean fell into the sound lung and shut it off. Secondary tracheotomy was required in two other cases.

Apparently the subglottic portion was too severely irritated by the frequent passage of the tube for removal of the fragments.

Lower bronchoscopy, which I must most earnestly recommend, was uniformly successful in thirteen cases—that is, the bean was removed. However, two died suddenly and others suffered for a long time from broncho-pneumonia before they were relieved. I still cling to the hope that we shall secure better results by earlier treatment, improvements in instruments and additional experience.

I have had constructed for the extraction of beans a special forceps which lately has been improved by my assistant, Brünings. It surrounds the bean after the fashion of an obstetric forceps, spreading easily by pushing (in order to dilate the bronchus and damage the swollen bean as little as possible) and closing with delicate pressure. Practice will demonstrate whether this instrument will meet all indications.

RESUME OF THE RESULTS FROM TRACHEO-BRONCHOSCOPY SO FAR ATTAINED.

If we endeavor to give an account of what has been attained by the new method of treatment of foreign bodies, we must consider that the 164 cases, published up to the present time, show many imperfections and comprise a time which can be called the infancy of tracheo-bronchoscopy. In some instances the upper method was not undertaken or failed, nothing could be seen, the extraction could not be carried out, or practice, experience or necessary instruments were wanting—introducing tube, exhaust pump and especially extraction instruments which had not been anticipated. The same things have played a great role in the easier lower bronchoscopy, so that many things in unexpected ways caused the operator to work in the dark after he had seen the foreign body.

In spite of all of this, most remarkable results have been secured. Most of the patients were relieved by one or the other method, and sometimes nature herself assisted by causing the foreign body to be coughed up (eight times). But of 159 cases (leaving out five with unknown result), twenty-one—13 per cent—died, for which the new method is but slightly responsible—two deaths from cocaine, two in which it was impossible to remove the object on account of bronchial stenosis and one from suffocation, in spite of upper and lower bronchoscopy. The remaining sixteen died of pulmonary

complications, five with the foreign body in the lung, and the others in spite of removal. Even a casual glance shows that early extraction will reduce the mortality to a minimum.

Upper bronchoscopy has been fully successful in fifty-four cases and lower bronchoscopy in sixty-three.

My own statistics give perhaps a better judgment for the future of cases of foreign bodies in the deeper air passages than the general, since I have gradually acquired a larger experience and practice. Nevertheless, I have the impression that in many cases my technic has not reached the highest mark and I hope to obtain better results in the future. As shown by the list of cases, only one death resulted in the eighteen cases and this was six months after the removal of the foreign body, caused by severe lung complication, due to its long sojourn in the air passages. In only two cases was I unable to find the foreign body and in only one was I unable to remove it on account of its being coughed up.

Upper bronchoscopy was performed in twelve cases, upper and lower in five and lower tracheo-bronchoscopy alone in one. However, I hope in the future, with improved technic, to be successful with the upper method at the first sitting and to use the lower only in the severest cases.

May the future bring this operation into general use.*

MY FOREIGN BODY CASES TREATED BY TRACHEO-BRONCHOSCOPY.

Needles:

Case I. I was called on in 1900 to treat a young man who, ten years before, when a school boy of 14 years, inspired a long needle with a black glass head, while playing with a pea shooter. The immediate symptoms were cough and attacks of dyspnea, which gradually disappeared. Two months before, following bodily exertion, there was a slight pulmonary hemorrhage, which did not recur.

The needle was visible in the Röntgen picture, in spite of its ten years' sojourn in the lungs. I made three upper bronchoscopic examinations of the right lung without finding the foreign body. Then I made lower bronchoscopy twice, after

*Since I wrote this, I have seen the foreign body removed by upper bronchoscopy at the first sitting, twice in my clinic and twice on my American trip. The first was by Dr. Von Eicken, the second by Dr. Brünings, the third and fourth by me in New York and Chicago respectively.

tracheotomy. The main passageway and the orifices of the lateral passages of the right bronchial system were carefully examined without finding the needle or any evidence of its presence. I surmise that it had stuck into the branches of the middle lobe or at least into the tissues in this neighborhood. Patient has remained well.

Case II. A druggist who for fifteen years was addicted to morphin had inspired the needle of a Pravaz syringe. The symptoms, which were mild at first, soon developed into a sticking pain in the chest and irritative cough. On the sixth day, the needle was observed by X-rays in the right lung, where it lay quite deep. Its shadow corresponded to the fourth rib anteriorly and to the seventh or eighth posteriorly. The head of the needle was below. When the patient came to me on the ninth day for examination I found numerous moderate ronchi over the right lower lung, especially on inspiration, but no dullness. Two days later, eleven after the accident, I undertook upper bronchoscopy under general anesthesia, after the patient had received an injection of his maximum morphin dose (0.06 gram.). The needle was discovered 34 cm. from the upper teeth, by means of the tube 35 cm. long and 11 cm. in diameter. I removed the needle, which was inclined from below and outwards to above and within; its point was inserted in the medial bronchial wall and covered with a granulation. The needle lay substantially in the main bronchus of the lower lobe, and its head stuck in one of its branches. I carefully cocaineized the neighborhood of the needle. The patient thereupon coughed, forcing the point of the needle free and it could then easily be grasped by von Eicken's forceps. The extraction was rapidly accomplished through the tube. The rales in the right lower lobe disappeared in a short time. Recovery.

Pebbles:

Case III. Boy four years old, August, 1904. An hour before, while playing, he had aspired a foreign body of unknown character. Slight dyspepsia, marked tracheal stridor. Cough, slight and infrequent. Chloroform anesthesia and bronchoscopy with a tube 21x0.7 cm. The foreign body was seen near the bifurcation, sticking partially in the right main bronchus. It was of a flat shape and could be readily extracted with tube forceps. The pebble was 13 mm. long, 8 to 9 mm. broad and 2 to 3 mm. thick.

The child slept a short time, waked up happy and pleasant and went home three hours after the extraction. Five hours had elapsed between the inspiration of the pebble and the return of the patient home. Recovery.

Pieces of Bone:

Case IV. Man, sixty-three years old, on March 27, 1897, while eating soup made of pork, inspired a bone. Cough, dyspnea, slight bloody expectoration. Three days later, direct upper tracheoscopy under cocain with patient in the sitting position. The tube was only 25 cm. long and 9 mm. in diameter. For all that, I was able to see the foreign body in the entrance of the right main bronchus and after some fruitless efforts I succeeded in removing it. The object was 17x14x8 mm. and was composed of spongy bone substance. Cortical bone was found in only one place. Patient left for home next day. Recovery.

Case V. Man, 42 years old, inspired a piece of bone, in March, 1896. Severe lung symptoms, pneumonic and pleuritic processes and bronchiectasis developed, until he was subjected to upper bronchoscopy on Dec. 21, 1899, under cocain and morphin. The bone was seen as a diagonally placed plate 3 cm. deep in the right main bronchus. It was very difficult to engage on account of extraordinarily abundant mucus products, but after some failures it was removed. It was 15x11x4 mm. The symptoms of the patient soon improved and after a year or so he was relatively well.

Case VI. Woman, 33 years of age, with slight tubercular infiltration of the left upper lobe, six months pregnant, inspired a piece of bone, fourteen days before. Since then, cough almost to suffocation. Upper bronchoscopy, under morphin cocain anesthesia, with a tube 35 cm. by 0.9 cm., patient in the sitting position, showed the bone in the entrance of the bronchus of the right upper lobe. Unfortunately, it was pushed with a cocain applicator into the right lower lobe and it stuck there so tightly that it could not be removed by a second upper bronchoscopy. The mucosa was swollen around it and was covered with fibrinous membrane. I performed tracheotomy and, several days later, used lower bronchoscopy with a tube 23 by 0.7 cm., the patient being in the recumbent position. In spite of the abundant mucus and pus, it was possible to pass the Lister hook beyond the bone and to effect its removal through the tube. Its dimensions were 8 by 7 by 5 mm. Im-

mediate removal of the canula. Recovery. The signs over the left apex had practically disappeared six months later.

Case VII. A woman, 20 years of age, came under my treatment, March 14, 1903, on account of a piece of bone which she had inspired in the middle of September, 1902. The sequelae were severe cough, shortness of breath, hemoptysis. On examination, a loud rale was heard posteriorly and inferiorly, strongest over the eighth rib on the right side. Upper bronchoscopy with a tube 24 by 0.9 cm. was performed the next day, with hanging head, under morphin chloroform anesthesia, as the patient was very nervous. The bone was found in the first lateral branch of the bronchus of the right lower lobe. In order to reach it well, it was necessary to introduce a tube 34 by 0.7 cm. through the former. The bone was situated 31 cm. from the upper teeth. The forceps was unable to engage, but the Lister hook was successful. It was supported by the end of the lower tube and the bone was drawn up, together with both tubes. In this way, unfortunately, it was lost, so it was again necessary to introduce the tube and the extraction was accomplished by Lister's hook at the second effort. The bone, which was of cortical and spongy substance, was 13 by 11 by 9 mm. in size. Recovery rapid.

Case VIII. Man, aet. 56. Inspiration of a piece of bone, February 7, 1904. As the patient suffered a great deal, he was put under morphin chloroform narcosis on May 21, 1904. Under upper bronchoscopy with a tube 32 by 1.1 cm., I found the piece of bone in the left main bronchus and, grasping it with the forceps, accomplished its extraction. The foreign body, covered with bad smelling pus, measured 2 by 1 by 0.5 cm. Recovery rapid.

Case IX. Man, aet. 24. Inspiration of piece of bone, Mar. 29, 1906. Mild pulmonary symptoms soon appeared. On May 23, under morphin chloroform narcosis, upper bronchoscopy was performed with a 9 mm. tube. It was impossible with the forceps and hook to grasp the bone, which was found in the right main bronchus, on account of the severe coughing paroxysms of the patient. The bone sank deeper so that it was not possible any more to get beyond it. I, therefore, performed tracheotomy immediately, and after some days, lower bronchoscopy with morphin cocain anesthesia. It was even still more difficult to take out the foreign body, first with fine, sharp hooks and then with the blunt Lister hook. Canula immediately re-

moved; signs of atelectasis of the right lower lobe disappeared after a week. Size of the bone 13x13x7 mm. Recovery.

Shirt and Collar Buttons:

Case X. Man, aet. eighteen, a half year before, inspired a shirt button into the left lung, followed by severe pulmonary symptoms, which developed into extensive bronchiectasis with tremendous pus production. It was unfortunately not possible to find the foreign body, although upper bronchoscopy was twice performed. I was forced, therefore, to perform tracheotomy and lower bronchoscopy on July 20, 1901, under morphin cocain. The extraction was, however, very difficult, inasmuch as the collar button had, through the previous fruitless efforts, been forced deep into the division of the left lower lobe bronchus. Finally, the button was held against the bronchoscopic tube with a Lister's hook and extracted, whereupon the pulmonary symptoms rapidly improved. Six months later, however, the patient was attacked with suppurative pleurisy on the other side, and died.

Case XI. Man, aged 40, inspired a shirt button on Dec. 27, 1902. Two days later, upper bronchoscopy was performed under cocain with the patient in the sitting position. The button was found deep in the left lower lobe bronchus. As it was placed diagonally, it was easily grasped with the hook, held against the tube and removed. Recovery.

Case XII. Boy, aged 10, inspired a porcelain collar button on August 20, 1905, followed by severe pulmonary symptoms with high fever. Upper bronchoscopy on the evening of the third day, under chloroform anesthesia, with a tube 9 mm. in diameter, which was introduced through a tube spatula. The button stuck in the left main bronchus with its plate above. No instrument, not even the hook, could pass it, as there was no space between the plate and the bronchial wall. Tracheotomy. Two days later, lower bronchoscopy. Extraction was accomplished with the Lister hook only after numerous fruitless efforts, as the head was so smooth that it always glided off. The lung symptoms disappeared after a few days. Early recovery.

Small Hollow Brass Bodies:

Case XIII. Boy, aged 8, twelve weeks ago (1903) inspired a brass case into the right lung. Upper direct bronchoscopy, with hanging head, under general anesthesia, with a tube 7 mm. in diameter, which was introduced through a tube spatula. The case was engaged in the lower end of the tube and was removed without any other agency. Recovery.

Tin Whistle.

Case XIV. A girl of seven inspired a small tin whistle belonging to a playing instrument, on April 18, 1904. Very severe paroxysms of coughing immediately appeared and an inspiratory stridor was heard. The other usual bad symptoms were absent. The Röntgen picture showed the foreign body at the level of the seventh rib behind on the right side. It was necessary to perform upper bronchoscopy three times under general anesthesia before extraction was satisfactorily accomplished, August 4, 1904. A tube 20 by 0.7 cm. was used, through which a second 5 mm. in diameter was introduced 5 cm. farther down. For extraction I had a special instrument made with four arms, which spread out when the head was pulled back. This was introduced into the hollow portion and thus the extraction was accomplished. Two days later the lungs were entirely free. Recovery.

Down Feathers:

Case XV. Woman, aged 42, who had for twenty years been engaged in picking chicken feathers, had been attacked with diffuse bronchitis for three years. She had occasionally coughed up down feathers. As it was possible that there were other feathers in the lungs, I performed upper bronchoscopy in January, 1902, under cocaine, with the patient in the recumbent position. It was not possible, in spite of the most careful search of the bronchial tree, to find a single feather, yet she coughed up such a one a few days later.

Case XVI. A nine year old boy inspired, August, 1898, a piece of pear into the right lung, which could be seen January 3, 1899, by means of upper direct bronchoscopy, under general anesthesia. It lay at the opening of the bronchus of the right middle lobe, and was covered in part with granulations. Inasmuch as a proper extraction instrument was lacking, the removal of the foreign body was postponed. Four days later, bronchoscopic examination showed that it was not present, since it had been coughed up in the meantime. Recovery.

Beans:

Case XVII. Boy, four years old, had inspired a large bean on the morning of September 27, 1898. At the beginning there were slight disturbances. In the evening, however, dyspnea and cyanosis appeared. The right half of the thorax was fixed on breathing. On the following day I performed tracheotomy on account of the dyspnea, whereupon the bean, which was still movable, appeared, but was immediately inspired into

the depths and could be removed only with a sharp hook under lower bronchoscopy. In the beginning, it had obstructed the right main bronchus. It was 10 by 18 mm. in size. The child recovered in a few days, after slight bronchitis.

Case XVIII. Boy, aged 6, inspired a bean on Oct. 31, 1900. On the evening of November 3 the right lower lobe was markedly dull, and the temperature 39.1 C (102.4 F.). Upper bronchoscopy, under general anesthesia, showed a swollen bean in the right main bronchus. It was impossible to engage it with the sharp hook. It was possible to reach it with the dull hook and to draw it into the trachea. A quantity of purulent mucus came out of the right bronchial tree. A piece of the bean cortex was coughed out; the remainder lay movable in the trachea, striking the cords violently on expiration. When I reintroduced the tube rapidly, the breathing was disturbed, as the bean was pressed against the tube on expiration. I pushed it back with forceps and engaged it, which caused it to break into pieces. Another piece of the cortex, and some of the smaller fragments, were coughed up; others I removed with forceps and hook through several introductions. One-fourth of the bean was still lacking, which must have been coughed up, as the most persistent search of the right and left bronchial system failed to reveal it. The temperature rapidly sank, the child improved, and ten days later had recovered from his bronchitis, and was discharged.

ESOPHAGUS.

My clinic provides, in the course of the year, a rich material in foreign bodies in the esophagus.

We performed esophagoscopy in all cases where the patient thought he had swallowed a foreign body, and we consider this method most satisfactory from a diagnostic and therapeutic standpoint.

The character of the foreign bodies which occur in the esophagus is not so varied as in the respiratory tract. They are mainly pieces of bone, meat fragments, artificial dentures, or parts of the same, and coins, especially in children. Needles, fishbones, and fruit seeds (plum), are occasionally seen. All other things are uncommon. Pieces of bone, meat fragments and dentures may be quite large. Small pieces of bone and food come into play, especially when there is stenosis of the esophagus. They may be impacted above or within it.

All foreign bodies in the normal esophagus are caught in the neighborhood of the cricoid, at the beginning of the esophagus, which is kept closed by muscular action and is opened only on deglutition. Everything that is not soft, smooth, and readily passable, and exceeds a definite volume, is lightly held in this place. In all cases in which a bougie has not been used on the patient, we may be certain that the foreign body is at the beginning of the esophagus near the lower portion of the larynx. Needles, fishbones, and nails usually stick in this place and glide down slowly with the food into the deeper portions. As a stenosis may easily result on account of the impaction of the foreign body in the entrance of the esophagus, the saliva itself is difficult to swallow. This makes the examination of the sitting patient very unpleasant and uncomfortable for physician and patient, on account of the excessive salivation. I prefer, therefore, to have such patients lying down on the right side, or left side, whether under general anesthesia or not. The operating table must be so arranged that the shoulder and head lie somewhat lower, so that the saliva, which is collected, runs out of the corner of the mouth.

Cocainization is employed while the patient is in the sitting position, and general anesthesia is used only in children. Care must be taken not to push the foreign body deeper during cocainization. It passes easily into the stomach, and we may search in vain for it. This is no great pity, as experience shows that, with favorable diet, the foreign body passes off in the usual way.

Sharp bodies, needles and nails, however, may occasionally cause annoyance. One of my patients could very easily feel the pin in his stomach, and in the evening in the cecal region. Another patient had very severe pains in the abdomen, as long as the needle journeyed through the intestines. Once we feared complications; however, everything went well.

When the foreign body slips into the stomach, the patient has the distressing feeling, until it passes away, that it may still cause unpleasant symptoms. It is, therefore, desirable for him, and for the esophagoscopist as well, that the corpus delicti be removed and exhibited.

Esophagoscopy is performed with a tube spatula which is introduced without insertion of the finger, under good light from a hand mirror or forehead lamp. The patient holds his

tongue, in the beginning. The collected secretion is removed with the exhaust pump. We approach the foreign body slowly with the tube spatula and locate carefully for the purpose of extraction.

Coins, pieces of bone, artificial dentures are situated in a flat position in the esophagus, in a frontal direction. We introduce a properly formed clutch forceps or bean forceps with branches in front and behind the foreign body, and then it may be easily removed. The highest portion should be engaged, so that it may not attach itself to anything and make it difficult to remove. When a sharp point has been caught, it must be pushed backward. Most of the bodies are too large to pass through the tube, and so are removed with it. There is an advantage, in that the tube dilates the way for the foreign body.

The resistance to be overcome in extraction is stronger when the mucous membrane over the foreign body is swollen by inflammation. No force should be used in overcoming this resistance. Impacted bodies may often be drawn some distance upwards, since the esophagus may be stretched. There comes a time, therefore, when the resistance is so increased that there is danger of tearing the esophagus. This condition is recognized when the released foreign body flies back immediately into its old location.

Coins are most certain of extraction, since they are smooth and are unable to wound anything. They can be drawn out with force, without the likelihood of doing harm. Coins should not be removed except by means of the esophagoscope. I do not consider that esophagotomy in this respect is a modern procedure any more. We must energetically defend this proposition. Not less should we oppose the use of coin removers. These cases are always in children, and it is just in such that the coin removers usually purchased may do harm. I once saw a case in which a colleague had slit almost the whole esophagus with a coin remover, after which he was unable to remove the instrument. After it was removed at the surgical clinic, I observed the wound by means of the esophagoscope. Of course the child soon died from suppurative mediastinitis.

Fruit seeds are to be treated like coins. Fishbones or needles may be grasped with von Eicken's forceps in the neighborhood of the point and removed.

Remains of food and pieces of meat slip very easily into the stomach if some space is made by cocaineization or by pressure with the tube. If they remain, they must have a very considerable caliber. Then the extraction may be difficult and of long duration. The forceps tears away the portion grasped, and so only a piece is removed. On this account, it is necessary often to re-enter, unless a very broad portion is seized. On the other hand, if a broad portion of the piece of meat is grasped, it may happen that on account of its size it finds so great resistance behind the larynx that it is impossible for it to pass, as happened in one of my cases. Only after I had gradually reduced it in size was the extraction successful.

Pieces of bone are not always of satisfactory form. Old persons who have impaired sensations of taste in the mouth, on account of a defective set of teeth, may swallow large bones unconsciously, without having a clear understanding of their size or form. It thus happens that there are really serious bones with sharp lateral processes which cannot be seen by esophagoscopy. These may become impacted upon extraction. If these do not glide readily, great care must be taken in extraction and success accomplished by pushing backward, moving to and fro, and grasping in different places. If not successful without force, esophagotomy is far better for the patient.

What has been said is true of artificial dentures. Here at least we have the advantage of knowing, from the patient, the size and shape of the foreign body swallowed. On this account, we are able to look out for projections and hooks. Besides, we will know whether or not the plate is made out of rubber or metal. In spite of all difficulties, many artificial plates have been successfully removed. I warn, however, the very energetic, against the exhibition of force. If there is a wound of the esophagus, severe symptoms will rapidly occur, which can be met only with early mediastinotomy or the patient is surely certain of death. If the extraction, by the natural way, appears risky, then esophagotomy is to be preferred. It is only when the artificial plate is not made out of metal and contains no metal that it will be possible to cut it up into pieces by the galvano-cautery snare, which was satisfactory in one of my cases. The snare is made narrow, and is pushed far beyond the plate. The wire is then pushed to one side (since the snare is unfolded better in this way).

There is now a large snare wire beyond the plate which catches it when drawn upward; it can be easily cut by a very small amount of heat. Perhaps there will be constructed harmless instruments which may cut metallic artificial plates within the esophagus.

I have been assuming, up to this time, that the foreign body is in the upper portion of the esophagus. It may, however, as has already been stated, be pushed deeper and deeper by the tube spatula and during the efforts at extraction, even as far as the cardia. The practitioners into whose hands the case first comes are often responsible for pushing it down. If otherwise there is no success, they exert themselves to push the foreign body into the stomach. We then usually find severer symptoms.

A simple tube spatula is no longer sufficient, so it must be lengthened by the introduction of tubes which will pass directly to the foreign body.

Naturally, the different depths required an extracting instrument which corresponds in length. The distance to the cardia in tall men is 50 cm. from the upper teeth. Accordingly, we must be prepared for this condition. The extraction is made more difficult on account of working in the deeper portions, but it is not so much as the uninitiated think. One may soon learn to throw a good light through the long tube sufficient to see and to carry on the technic of extraction. Even complicated treatment may be undertaken in the neighborhood of the cardia, as shown by the case reported of cutting up of artificial plate within the esophagus.

It is much more serious when a larger foreign body, which cannot be cut up, is impacted in the deeper portions. In such cases gastrotomy must be performed and the foreign body removed from below. Posterior mediastinotomy was in one case successful, but, unfortunately, this operation is still so dangerous that it is almost always followed by death.

If the foreign body lies above or within a stenosis, the same rules apply for examination and extraction. One will hardly meet with greater difficulties; under certain circumstances the patient may be saved from a gastrostomy already planned.

There are cases also in which esophagoscopy is contraindicated from the beginning. It is best to refrain entirely if the symptoms indicate that there is a perforation of the wall of the esophagus: i. e., intense pain in the neighborhood of the

perforation, increased temperature, emphysema of the skin. We should look out for such symptoms, especially if some one else has dealt with the patient. The esophagus may cut itself on the sharp surface if a strong effort at swallowing is made.

A perforation necessitates an external operation. The tissues in the neighborhood are very rapidly infected and must be very widely opened and the point of perforation found. It is therefore best to leave the foreign body alone and to make an esophagotomy; in this way the position of the perforation will be more easily found. As to the question whether to open on the right or the left side, the greater pain decides. The chances for cure are better in the high perforation. We were successful in two patients. A patient with deep perforation died in spite of mediastinotomy from the neck. Here deep posterior mediastinotomy bespeaks better results.

I must still mention that, instead of a foreign body, there may be only scratches, especially in the neighborhood of the pharynx and entrance of the esophagus, which make the patient believe that the foreign body still sticks there unless we demonstrate the opposite by esophagoscopy examination. I do not believe that a foreign body in the esophagus can be overlooked under proper technic.

If I exclude the two cases in which the patients already had severe wounds of the esophagus, I have no deaths to report; all were promptly cured. This is certainly a good result in 17 cases.

FOREIGN BODIES IN THE ESOPHAGUS: CASES FROM THE CLINIC TREATED BY G. KILLIAN AND C. VON EIKEN.

Case I. Man, aged 62. September 24, 1898. Two hours before, he swallowed a bone, since which time he has had severe pains in the neighborhood of the cricoid cartilage. Difficulty in swallowing. Esophagoscopy. By pushing the tube behind the cricoid, the piece of bone was observed for a moment; it was freed from its lodgment and, with lightning rapidity, disappeared in the depths. After several days it passed off in the natural way. It was of spongy material, 1 cm. long by 0.75 cm. wide.

Case II. Woman, aged 26 years, March 7, 1903. Yesterday evening, patient swallowed a small chicken bone. Severe

pain below the larynx. With the laryngoscope, a blood blister was seen deep in the left sinus pyriformis. Esophagoscopy with a tube spatula 14 by 1.3 cm. A small and pointed bone was found in the upper portion of the esophagus impacted in the mucosa; it was grasped with a forceps, loosened and removed; 12 by 2 mm. in size. Recovery.

Case III. Woman, aged 79. May 19, 1902. Patient swallowed a bone while eating soup two days ago. The physician made fruitless efforts to remove the foreign body. Severe pains appeared the following night, which kept the patient from swallowing anything. An examination for extraction was made on the third day after; we found hemorrhage on both sides of the palate and in the left sinus pyriformis. The left ventricular band and vocal band were decidedly reddened. Esophagoscopy. At first a short tube was used and then a tube 39 cm. long by 9 mm. in diameter. Just above the cardia a large piece of bone projected with a sharp edge upward. Extraction with the tube. Recovery.

Case IV. Man, aged 59 years, on December 29, 1901, swallowed, with his soup, a piece of bone which remained in the neighborhood of the cricoid. Patient ate bread afterwards and thereby the bone passed down somewhat deeper. A physician sought to push the foreign body into the depths with a sponge probang, but was successful only for a short distance. Attempts with other instruments were without success, and the instruments were covered with blood when they were removed from the esophagus. Patient had no more pain afterwards. At about nine o'clock of the evening of the same day, under esophagoscopy, with a tube 14 mm. in diameter by 25 cm., measured from the upper teeth, the esophagus was found filled with blood clots, among which shreds of tissue were visible. After thoroughly cleaning the field of view with the exhaust pump, a very severe wound of the esophagus was observed. At the same time a brownish red body presented itself, which was found, on extraction, to be a piece of meat. Another introduction of the tube led to the finding of the bone. Its point was grasped by the forceps. There was enormous resistance upon drawing it, whereupon the foreign body was pushed some distance deeper by the tube and then removed. An unusually large, flat bone came to view, 3.6 by 2.8 cm. large, which on one side presented long prongs which were arranged opposite the apex of the bone and which acted

as barbs. At the beginning, the patient's symptoms were moderate, the pain lessened, but later there was additional pain on the right side. Morphine injection. Temperature the next morning 38.4 C. (101.1 F.). External mediastinotomy was performed in the surgical clinic by Kraske. The esophagus was stretched and infiltrated, and was followed 10 cm. into the chest. Wide opening of the tissues, but perforation not found. Increased symptoms and fever. Death in one week. Autopsy showed a large tear which began 10 cm. below the cricoid and was 5 cm. long. This led into a putrid abscess in the right mediastinum, opposite of the hilus of the right lung. We had been unable to find the tear, because we were operating on the wrong side. This would have been prevented if an esophagoscopy examination had followed the extraction. This was attempted but the electric light failed.

Case V. Man, aged 20, swallowed a bone of a hog on August 12, 1905, which was pushed down by the physician in attendance. Pain was experienced 35 cm. from the upper teeth. Fluids only could be swallowed. Esophagoscopy was performed two days later with the patient lying on the left side, the tube being 42 by 1.4 cm. The bone appeared at a distance of 36 cm. in a diagonal position. It could be easily grasped but it slipped away at 20 cm. and was again grasped, after which the extraction was successful. Secondary examination showed a small wound of the mucosa where the foreign body lay. Recovery.

Case VI. Man, aged 21, had swallowed, on that morning, a piece of chicken bone which stuck 22 cm. under the cricoid. Esophagoscopy, with a tube 30 by 0.7 cm., revealed the bone, surrounded by remains of food. Fruitless efforts with the bean forceps were followed by success with the toothed forceps. Length of bone, 3 cm. Course good.

Case VII. Woman, aged 69, had, since day before yesterday, that is November 13, 1906, a bone in her esophagus. Pain behind the cricoid. The attending physician made four attempts to push it down. Severe pain followed in the lowest dorsal vertebra. Temperature 37.5 C. (99.5 F.) Laryngoscopy showed mucous membrane in left sinus pyriformis swollen. The bougie discovered a resistance at 38 cm. Esophagoscopy, in the right lateral position, with a tube 42 by 1.1 cm. At a depth of 36 cm., a sharp horizontally placed piece of bone was observed. This was grasped with the forceps, but

was caught in the mucous membrane with its upper end, upon being drawn out, so that it became necessary to release it. Upon new efforts being made with the tube, it suddenly disappeared into the stomach. Course good.

Case VIII. Man, aged 43, while eating noodle soup, swallowed, at 11 o'clock today, a bone which remained sticking in his throat. The patient ate a great deal of meat afterwards, in order to force the bone down, but the attempt was not successful. Severe pains in the jugulum. Esophagoscopy with tube spatula three hours later. Only after removal of some pieces of meat could the bone be seen and extracted with the toothed forceps, after overcoming a certain resistance. It was as thick as a small thumb with an apex upward and a broad portion downward. Some scratches were discovered by subsequent examination. Patient soon left for home. Recovery.

Case IX. A boy, aged $1\frac{1}{2}$, swallowed a coin on January 13, 1903. Several hours later this was found by means of Röntgen rays, sticking under the cricoid where it could be felt with the finger. Slight general anesthesia. Tube spatula. Extraction with forceps. The coin was a ten pfennig piece.

Case X. Girl, aged 9, in August, 1904, two days before swallowed a coin, which was visible with the Röntgen rays under the cricoid. Esophagoscopy, patient on the left side. A tube 18 by 0.7 cm. was introduced with a guide tube. The edge of the coin came into view under an inflamed swollen portion of the mucous membrane. The inflammatory swelling caused a distinct resistance to extraction. Recovery. The coin was a two kreutzer piece of 1815.

Case XI. Girl, aged 10, had swallowed a two pfennig piece two hours before (August 10, 1906). Difficulty of swallowing. Coin visible in Röntgen picture under the cricoid in a frontal position. Esophagoscopy in sitting position under cocaine, with a tube spatula, 12 by 0.7 cm. The coin could be seen but could not be grasped on account of the great salivation. Thereupon esophagoscopy was performed in the lateral position with a longer tube. Saliva was drawn off with the exhaust pump. The coin in the meantime slipped into the stomach and passed off in a few days with the feces. Recovery.

Case XII. Child of $2\frac{1}{2}$ years had swallowed a five pfennig piece twelve days before October 10, 1906. Transitory fever.

Swallowing of food difficult, milk only being possible. The child had suffered for some time from an extensive infantile paralysis. The coin was visible in the Röntgen picture in the upper portion of the esophagus. Esophagoscopy, under general anesthesia, on the right side. Introduction of a tube, 5 mm. in diameter, could only be accomplished by bending the head as far back as possible. A resistance was encountered in the upper portion of the esophagus, which appeared as a circular stenosis with whitish deposit on the mucous membrane. After cleaning the field with the exhaust pump, the upper portion of the coin was visible. The esophagus opened up at each inspiration, so that it was easy to grasp the coin at that moment. There was some resistance in the neighborhood of the stenosis. Recovery from the effects of the foreign body.

Case XIII. Man, aged 67, had swallowed, on the evening of the day when he came to me, December 29, 1906, a large piece of solid meat of a hog's heart, without much chewing. Patient was in a hurry; he had no teeth. The piece of meat remained sticking in the esophagus. Upon breathing, rales were heard which could be clearly established by the mirror, as caused by the collection of saliva over the larynx. He could not swallow the saliva, as the esophagus was completely obstructed. He could clearly feel that the piece of meat lay high up at the orifice of the esophagus. Esophagoscopy in the left lateral position, under cocain. The mass was grasped by aid of the tube spatula, but upon extraction only a piece was torn off. This was repeated several times. As a result, the piece of meat descended, so that a longer tube was required. The extraction was again not completely successful, only the portion grasped being removed. It was then possible to draw the mass again as far as the cricoid. After a short pause, the tube spatula was again introduced. The mass again descended, so that it could now be reached only with a 40 cm. tube; still I was again able to raise it after removal of a piece, but it once more slipped down. In the endeavor to grasp it in this place, a small piece of the mucosa was caught, causing it to bleed. I made an attempt to push the mass into the stomach, but was unsuccessful as it was too large. There was nothing left except again to perform esophagoscopy, with a tube 50 cm. long, using one of my longest toothed forceps, about 60 cm. long. I soon grasped the mass

of meat and drew it up behind the cricoid where I could bring the tube spatula into action. The forceps tore off a large piece. The mass descended slightly, so that a longer tube was again necessary. It had become so much smaller in volume that it could finally pass by the cricoid. The whole procedure lasted about an hour and a half. In spite of it all, the patient was comparatively little affected. I would not permit him to eat until the second day following, on account of the wounding of the mucous membrane; he was only given some alcohol from time to time. He had some little pain in the throat and slight elevation of temperature. However, the symptoms disappeared by the third day and the patient could soon be discharged as cured.

Case XIV. Woman, aged thirty-seven, on March 3, 1907, while eating soup, swallowed a small plate with two teeth, and came immediately to the clinic. The plate could be felt externally under the cricoid, and it was shown in this place by the Röntgen picture. Esophagoscopy with tube spatula 20 by 1.2 cm. The plate came immediately into view at the opening of the esophagus and was easily removed. Recovery.

Case XV. A woman, aged 32, had swallowed a tooth plate. The Röntgen rays examination gave no result, but with the probe a foreign body could be felt in the esophagus. Attempts to remove or dislodge it were unsuccessful. I saw the woman for the first time eight weeks after the accident. She had, in the meantime, lost strength considerably, not being able to take sufficient nourishment. An examination with the esophagoscope was made and I found the foreign body impacted in the esophagus at a distance of 35 cm. from the upper incisors, therefore near the cardia. I attempted to extract the plate by means of a tubular forceps, but as the resistance offered was so great that I was afraid of injuring the esophagus wall, I had to give up further attempts in this direction. I now began to consider the possibility of diminishing the size of the foreign body and of removing it piecemeal. At first I was able to burn off only a small part, but at a third attempt I succeeded in cutting the plate into two parts by means of a galvanic snare. I introduced this snare with a small loop only, at the side of the plate; then I gradually enlarged the loop by pushing the wire forward on one side only, and then drawing it back. I caught the foreign body, and was able to cut it through with incandescent wire. The

two pieces were easily removed with forceps. I take pleasure in showing them to you here. The patient recovered without interruption. (*British Med. Journal*, August 30, 1902.)

It should be reported that we have, during the past years, examined 17 cases by means of esophagoscopy, in which the foreign body was not present at the time of the examination; scratches only could be found in a portion of the cases. All remained without any bad results. In some, the foreign body soon passed away; in others, it is doubtful if there had been one present. In the last case of this sort, I found a small beginning carcinoma instead of a foreign body. The two following cases may be of interest, although esophagoscopy was not undertaken; it was contraindicated.

Case XVI. A young man came, in the summer of 1904, to our clinic early in the morning, after he had swallowed a fragment of glass on the evening before. It was very hot, and he was very thirsty; he had, with avidity, taken a glass of beer. Although he had broken the glass on the edge of the table, he nevertheless drank it very rapidly, as a result of which a piece of glass stuck in his throat. This could be seen by the Röntgen picture behind the larynx, five or six hours later, when the patient came under our observation. He was suffering greatly and had continual paroxysms of swallowing accompanied by severe pain in the throat. The temperature was 37.8 C. (100 F.). Examining his neck, I found an emphysema of the skin, establishing the existence of a perforation of the esophagus. Evidently the sharp edge of the glass had cut the mucosa and the constrictor. Bloody mucus was seen behind the larynx by means of the laryngoscope. Immediate esophagotomy was indicated in this case. This was performed in our surgical clinic by Dr. Pertz, on the left side, where the pain was greatest. The perforation was found here on the lateral wall of the hypopharynx; after dilatation, it was easy to remove the foreign body. Patient recovered after suffering for some time from esophageal stricture.

Case XVII. A soldier, aged 30, came to the surgical clinic on Aug. 13, 1906, and stated that he had swallowed an artificial denture on the evening before, which consisted of an incisor tooth with a small rubber plate. Efforts at extraction with forceps were made by the attending physician. The patient had pain on swallowing, slight elevation of temperature. I found definite evidence of emphysema of the skin on the

right side of the neck from the face to the third rib, showing that there had been a perforation of the esophagus. For this reason, I refrained from performing esophagoscopy and recommended that esophagotomy be performed in the surgical clinic. As the symptoms indicated it, Kraske opened the neck on the right side and found a perforation in the lateral wall of the hypopharynx. The artificial denture could no longer be found in the esophagus. The bougie entered the stomach without obstruction. Three days later the plate passed off with the feces. Patient recovered after having a temperature for two days of 38.8 C. and 38.5 C. (101.8 and 101.3 F.).

XXI.

MODERN PROCEDURES IN EXCISION OF INTRINSIC MALIGNANT GROWTHS OF THE LARYNX.*

BY DR. J. SOLIS-COHEN,

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Modern procedures exclude all attempts at intralaryngeal extirpation of intrinsic malignant growths of the larynx as virtually futile, except under fortuitous conditions not to be expected. Hence, direct access from the exterior is to be practised in consonance with general surgical principles.

This procedure comprises a central division of the thyroid cartilage, and sometimes of the cricothyroid membrane, cricoid cartilage or even of the trachea, as may be requisite to fully expose the morbid mass and its immediate surroundings when the wings of the thyroid cartilage are separated with retractors or with stout loop ligatures.

This may be done under either local or general anesthesia, and with or without precedent tracheotomy; the choice being dependent in great measure on the location and apparent extent of the neoplasm, and in part on the predilections of the operator.

For many years the writer's preference was for prophylactic tracheotomy several days in advance of the main operation, in order that the patient might become accustomed to the presence of a canula, the retention of which might be requisite for an indefinite period. This opinion, however, has been proven erroneous. Prophylactic tracheotomy is not requisite except where strong indication exists for the precautional use of a tube after operation.

The operative and postoperative technic has become so simplified of late, that the tracheotomy safety tube may be permanently withdrawn in most instances when the operation has been completed. Nevertheless, a properly prepared canula should be at hand for prompt introduction should contingencies arise requiring it. In such instances as seem to demand

*Read at the Twenty-ninth Annual Congress of the American Laryngological Association, May 8, 1907.

retention of canula, a fresh one should replace the tube used during the operation.

Forty years ago the writer reported¹ the extirpation, under ether, of a fibroid growth from the interior of the larynx after access by thyrotomy, without any tracheotomy whatever. On the seventh day the patient, a journeyman shoemaker was working at his last, having been able to sit up within less than twenty-four hours after the operation, and to take a walk in the street upon the fourth day. In this case, as in most of the few other cases upon which the writer has operated, the growth was removed with forceps and scissors; and no stitch whatever was taken in the thyroid cartilage or in its perichondrium.

The immediate technic of operating most in vogue at present is to begin, under chloroform inhalatory anesthesia, with an incision through the skin from the hyoid bone to some distance down upon the trachea. Then a tracheotomy is performed and a tampon canula inserted. The thyroid cartilage is then thoroughly exposed and divided in the median line with bistoury, saw, scissors, or cutting pliers. The wings of the thyroid are separated with retractors or with strong ligatures; cocain solution is applied to the interior of the larynx to control reflex movements, which otherwise are often very embarrassing during the dissection; adrenalin solution is subsequently applied to contract the bloodvessels and lessen the immediate hemorrhage of the excision, while at the same time it facilitates definition of the growth. Under careful retraction of the sides of the larynx, with the best available illumination, whether natural or artificial, the entire diseased tissues are exposed to vision, and removed with a surrounding zone of healthy tissues sufficient to secure the patient immunity from immediate recurrence *in situ*.

The writer continues to prefer his own method, which is to begin with an ordinary tracheotomy in the first place, and, after introduction of the canula, to incise the skin only so far as to uncover the larynx, thus leaving intact a broad bridge of skin above the canula. This lessens, considerably, the dimension of the external wound and favors reunion in the sequence. Should due exposure of the morbid parts require it, this bridge can be cut into, or be sacrificed entirely, but in the majority of cases under consideration it can be spared.

1. N. Y. Medical Record, 1867, p. 218.

Tracheotomy having been performed, a tampon canula is to be introduced to occlude the upper portion of the trachea; preferably Hahn's sponge-covered canula kept in an aseptic solution during the early steps of the operation so as to saturate the sponge. According to conditions, some little time, usually ten to twelve minutes, will have to elapse before the sponge becomes swollen sufficiently to fulfill its purpose and secure the trachea against the entrance of blood. This time is utilized in exposing the thyroid cartilage and getting it ready for division.

Hemorrhage having been controlled, the thyroid cartilage is divided in the middle line with strong, obliquely bent, short, cutting pliers, the lower blade being first thrust through the cricothyroid membrane and passed up to the incisure. In young people a stout bistoury will suffice. The wings of the cartilage are then held asunder with retractors, firmly, but gently, and if the exposure be insufficient for careful manipulation, the cricothyroid ligament and, if necessary, the cricoid cartilage may be divided to afford the required access to the parts. These parts being duly exposed, the interior surface of the larynx is freely mopped with a solution of cocain until the reflex movements are under control, and then the morbid mass, and half an inch or more of surface around it, should be mopped with a solution of adrenalin to diminish hemorrhage and define the growth. When saliva and mucus flow too rapidly into the larynx for control with mopping by an assistant, a tampon secured to a ligature for easy withdrawal can be pressed into the lower part of the pharynx so as to occlude it and absorb the secretions. In the few instances operated upon by myself this tamponing has not been necessary.

Bleeding and secretions being under control, the excision can be begun. The usual method is to surround the parts to be removed with an elliptic or oval incision down to the perichondrium, and so excise the mass with scissors or bistoury as to remove it, together with the underlying mucous membrane, and then carefully scrape the perichondrium and apply an escharotic. My own preference is, when practicable, to strip the inner perichondrium from the wing of the thyroid cartilage under the entire surface of the parts to be removed, raise the mass intact and sever it with serrated scissors at a distance, as far as may be, of about half an inch from the growth which is left untouched by any instrument, so that it

is removed in one piece looking like a miniature mass of flesh upon a fleshy plate. If the growth be located in the anterior or central portions of the half of the larynx, the denudation of the internal perichondrium can be begun from in front with an elevator or a dull pointed dry dissector such as Allis's, and then working it underneath until the whole of the portion to be severed has been raised from the cartilage. In cases where the growth is too far removed from the line of the thyrotomy incision, the elliptic incision to surround the growth may be made so as to extend through the perichondrium, and the perichondrium can then be attacked at the most accessible point, first with a sharp elevator and then with the blunt dissector.

After the removal of the morbid mass and the drying of the parts, the raw surface is thoroughly mopped with compound tincture of benzoin, and the wings of the thyroid are allowed to reapproximate. The tampon canula is now withdrawn from the trachea, and if breathing be comfortable no attempt is made to introduce another canula unless contingencies arise for it in the after treatment.

Should the adjustment of the wings of the thyroid cartilage be accurate there will be no necessity for taking stitches in the cartilage or in the external perichondrium to keep them in place. The natural resiliency will suffice, for cough occasions less disturbance than is theoretically surmised. Should the wings of the cartilage override, however, it will be necessary to insert sutures to keep them in correct apposition.

In my own practice no stitches are taken in the skin wound. Instead, a longitudinal strip of perforated plaster is placed along each side of the neck an inch or so from the line of incision, and then this plaster is sutured in several places through the perforations, along the line of thyrotomic incision, and tied only so tightly as to bring the severed edges of skin into gentle apposition, and leave the wound free for easy and immediate inspection. No threads are passed over the line of the tracheal incision, which is left bare to favor expulsion of matters from the air passages. A pad of gauze moistened in bichlorid or other antiseptic solution is then placed upon the wounds, while a strip of aseptic gauze is doubled over a strip of adhesive plaster and secured to the neck, so that the gauze hangs down over the dressing upon the seat of the wound. In this manner, there is no strain upon the skin from stretching of sutures, and the parts are readily accessible to inspection and manipulation.

The bed of the patient should have the foot portion raised so as to insure the flow of secretions toward the mouth and away from the air passages, and be so maintained as long as necessary. The patient should be placed near the edge of the bed lying upon the side of operation, and without a pillow under the head. When thirsty, an attempt may be made to draw sterilized water up into the mouth from a bent tube inserted at its lower edge. This will sometimes be practicable within a few hours, and then suitable nourishment can be administered in the same way until cicatrizations are sufficiently advanced to allow the use of more solid food. Should this plan be impracticable, nourishment should be administered by the bowel for a short time, or until deglutition becomes safe.

The post-operative treatment is as important as the operative procedure, and, therefore, the operator or a sufficiently skilled assistant should be within immediate call at least during the first twenty-four hours to combat any adverse conditions which may arise, although it will often be the case that nothing untoward does occur. But when anything untoward does occur, the presence of some one able to meet the emergency may be a matter of vital importance. Should it become necessary for any reason to re-introduce a canula into the trachea, which has to be maintained for several hours or longer, some method for moistening the atmosphere near the head of the bed should be provided so as to prevent the secretions from dessicating, and a piece of moistened gauze can be kept over the orifice of the canula. The external parts are treated on general surgical, antiseptic principles, and, although cicatrization by granulation is to be more or less expected, a large portion of the external wounds often heals by first intention, thanks to the absence of constricting strictures even in the upper portion of the cutaneous incision, and to the bridge of tissue preserved between the incisions for tracheotomy and for thyrotomy.

Under favorable conditions the patient should be able to sit up in three or four days, and should have practically recovered from the operative procedures in from two to six weeks.

In the description of this method it will be observed that much has been learned from the experience of Dr. Butlin and Sir Felix Semon, as reported during recent years; especially the preference of preliminary to prophylactic tracheot-

omy, the use of the loop of ligature in spreading aside the wings of the thyroid when the retractors are insufficient, and the removal of the tracheotomy canula immediately after the extirpation of the growth and attention to the wound of excision.

The retention of the skin bridge between the incisions for tracheotomy and for thyrotomy, the removal of the growth in mass upon a plate of excised perichondrium and superjacent tissue, the dressing with compound tincture of benzoin, and the avoidance of sutures in the cartilage and in the skin, and the special method of loosely approximating the edges of the incisions together are the chief points of variance from the usual methods in the practice of the writer.

XXII.

MYXOFIBROMA OF THE NASOPHARYNX, CAUSING DISFIGUREMENT—REPORT OF A CASE AND EXHIBITION OF SPECIMEN.*

BY D. BRADEN KYLE, A. M., M. D.,

PHILADELPHIA.

The etiology of fibromyxoma of the nasopharynx is still somewhat speculative, but the pathology and site are well known. Simple fibromyxoma may spring from, and be located purely in, the nasopharyngeal space. Its common site of origin is from the basilar process of the occipital bone, a location from which it slowly, but surely, spreads. There seems to be no law controlling the rate or direction of its growth. It may extend upward, producing displacement of bony structure to such an extent as to demand prompt and thorough surgical interference. On extending downward it may fill the nasopharyngeal space and even involve the pharynx.

The symptoms will be determined by the extent of the growth and the line of involvement. If the tendency is downward, there will be early impairment of the voice resonance, the sensation as of the presence of a body in the pharynx, causing continuous swallowing, sensitiveness of the surrounding parts, a slight tendency to hemorrhage, and the individual will have a gaping appearance, owing to the necessitated mouth-breathing. When the tumor extends downward, there will be interference with the normal faucial movements, owing to the obstruction and some partial paralysis from the pressure; there will also be no loss of motion of the soft palate and uvula. If the growth extends upward and reaches sufficient size, the disfigurement of the adjacent structures may take place. There is usually persistent headache and a great feeling of pressure over the bridge of the nose.

The morbid histology of the tumor in this location differs from that found in the nasal cavity only in the fact that there

*Read before the American Laryngological Association, Twenty-ninth Annual Congress, Washington, D. C., May 9, 1907.

are more bundles of fibres and fewer individual stellate cells. This is probably due to the fact that in the nasopharynx and fauces there is more connective tissue present.

The common symptoms of a nasopharyngeal growth of this size are inability to breath through the nose, fullness in the head, with the characteristic nasal twang, difficulty in swallowing, choking sensations, deafness and tinnitus.

The particular case which I wish to report and from which the specimen (see cut) was removed, was a young man, aged 24 years, who presented himself at the Out-Patient Department



Myxofibroma of the Nasopharynx. (Full size)

of the Jefferson Medical College Hospital, complaining of inability to breathe through his nose and also of almost continuous pain or aching in the region of the frontal sinus or over the bridge of nose. On the right side the tumor mass had extended so far forward as to almost protrude from the nostril. By the aid of the rhinoscope the mass in the nasopharynx could be distinctly outlined, although it did not extend below the margin of the soft palate. There was considerable

catarrhal discharge, but no associated symptoms evidencing any involvement of the accessory cavities or the ear. In other words, the symptoms were all directed toward the point of pressure, the bridge of the nose at the inner corner of the right eye, where the distinct swelling stood out prominently. The right nostril was entirely occluded by the tumor mass, while the left nostril was occluded owing to the septum having been deflected by the tumor.

After the removal of the tumor the external displacement and swelling entirely disappeared. I have seen a number of cases of myxofibroma, but this one, to me, was rather unique, and I thought it worth reporting to you.

My object in reporting this case is to call attention to a number of interesting points. First, the site of origin of these pedunculated masses was at the posterior end and underneath the superior turbinated body. Second, as a rule, the tumor extends downward into the nasopharynx, and in a number of cases which I have seen and operated upon the tumor or tumors were of sufficient size to cause pressure, displacement forward of the soft palate and even extend below the margin of the soft palate. However, in this particular case, only one of the tumor masses extended into the nasopharynx, while the others turned forward and completely blocked the right nostril, and by their gradual increase in size had displaced the bony septum to the left, occluding the nostril. Third, the growths did not follow the line of least resistance. Fourth, there was practically no hemorrhage. Fifth, each tumor was pedunculated. Sixth, there was no involvement of the ear. Seventh, there was no evidence of sinus involvement except the pain, and after the removal of the tumor this entirely disappeared. The right nostril was entirely blocked by the new growth and there was marked disfigurement at the inner angle of the right eye. The patient suffered considerable pain only over the region of displacement and swelling. When the growths were removed the index finger passed into the nasopharynx could be carried forward through this enormously dilated nostril. The bony septum seemed to have been softened by the pressure and inflammatory process and was easily forced back into the median line by means of the nasal dilator and remained in position without the support of nasal splints.

The last time I examined the patient, some six weeks after the operation, the nasal passages were in good condition and practically of equal size.

1517 Walnut Street.

XXIII.

CYSTS OF THE NASOPHARYNX.

BY RICHARD H. JOHNSTON, M. D.,

BALTIMORE.

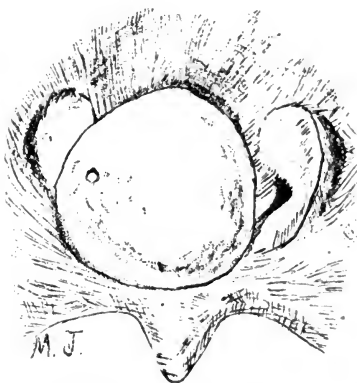
SURGEON AND PATHOLOGIST TO THE PRESBYTERIAN EYE, EAR
AND THROAT HOSPITAL; LECTURER ON DISEASES
OF THE NOSE AND THROAT IN THE UNI-
VERSITY OF MARYLAND.

Cysts of the nasopharynx are of two kinds; one, usually small, occurring in the roof of the cavity and enveloped by adenoid tissue; the other, much larger and more important, growing from the pharyngeal vault or from the posterior end of the inferior turbinated body. The former variety is comparatively common and is formed by the obliteration of the external orifice of the pharyngeal bursa under the influence of an inflammatory process; they are analogous to the lacunar cysts of the faucial tonsils. The latter variety springs from the lateral remains of the pharyngeal tonsil, which are usually irregular and more or less mammillated. They are formed by the obstruction of a single mucous gland, the excretory canal of which has been obliterated by an inflammatory process. In speaking of cysts of the nasopharynx, Morris Schmidt says that they are fairly common on the roof, where they arise either from purulent follicles or as retention cysts of acinous glands. It is the latter variety of cysts which will be dealt with in this paper, since they are rarer and cause more urgent symptoms than the former.

Cysts of the nasopharynx were studied as far back as 1863 by Czermak and later by Tornwaldt. They occur between the ages of 20 and 50 years, and statistics indicate that they are more frequent in males. Here is the clinical history of a case seen by me in February of this year: Miss S. J. R., aged 50 years, had experienced for some years difficulty in breathing through her nose. By day and by night she was compelled to keep her mouth open to obtain sufficient air. The trouble had increased slowly, and though she had consulted a specialist, her condition did not improve. For twelve

months she had had severe asthmatic attacks, which would awaken her from a sound sleep and cause a sensation of impending suffocation.

From time to time she would have acute laryngitis with marked hoarseness. The onset of the asthma had alarmed her greatly. When the patient consulted me, she presented all the symptoms of a confirmed mouth-breather and was in a bad condition generally. Examination of the nose showed a decided deviation of the septum to the right, so that it was impossible to get much air through the right nostril. In the left nostril the inferior turbinate was in a state of intumescent hypertrophy. Turning my attention to the throat, I found the right tonsil enlarged, with deep follicles. The pharynx was dry from the continued mouth breathing. The



Cyst of Nasopharynx, Author's Case.

throat was so irritable that cocain had to be applied to get a good view of the nasopharynx. With the mirror a large round tumor was seen completely blocking up the nasopharynx. The color of the mass was gray at some points and pink at others. To the probe there was imparted a distinctly doughy sensation. The growth was almost on a level with the border of the soft palate. The color and general appearance reminded one of a fibroma. The sensitiveness of the throat was so pronounced that it was not possible to palpate the tumor with the finger. The point of attachment could not be seen since the nasopharynx was practically filled with the growth. I was undecided as to the diagnosis, and, as the patient dreaded an operation for the removal of

the tumor, I proposed straightening the septum first. This was successfully accomplished by the submucous method and the obstruction in the right nostril entirely relieved. The patient suffered no pain, and, her fear of operative procedures being somewhat removed, I suggested a second operation for the removal of the tumor. I first tried to pass a wire around the mass through the nose, but on account of the almost complete obliteration of the nasopharynx, this was not successful. Then an effort was made to snare the tumor through the mouth. Though the mucous membrane was treated with a 20 per cent solution of cocain, the nasopharynx would not tolerate the finger long enough to slip the wire around the growth. The fact that the attachment could not be seen, made the undertaking much more difficult. Finally, a general anesthetic was proposed and accepted. Under ether anesthesia, a finger was passed into the nasopharynx and an attempt made to slip a wire around the growth. There was a sudden rupture of the cyst with collapse of its wall and the escape of a thick, dark grumous fluid. Since only the cyst wall remained, the wire could not be used. With cutting forceps under the control of the finger, the wall was removed piecemeal, as well as possible. The patient made a good recovery from the operation. A few days later the mirror showed the remains of the cyst wall; these were cauterized with the electric cautery through the nasopharynx, with the result that the growth has entirely disappeared and the patient is perfectly well. The pieces removed with the forceps were hardened in alcohol, imbedded in celloidin, sections cut and stained with hematoxylin and eosin. They were made up of connective tissue covered externally and internally with cylindrical epithelium. The contents of the cyst were lost during the operation.

Cysts of the nasopharynx, if small, may cause no symptoms. But as they increase in size, symptoms of nasopharyngitis develop. The patient may complain of defective hearing and tinnitus caused by a tubal catarrh. Still later, nasal obstruction is experienced and sometimes reflex disturbances appear such as asthma or spasmodic cough. The patient becomes a mouth-breather. If the nostrils are large, the tumor can sometimes be seen by anterior rhinoscopy. In the above case, by shrinking the turbinate in the left nostril, the grayish reflex of the mass could be seen. The growth of a cyst is usually slow; it may be several years before symptoms of

urgency develop. When it has attained a considerable size, it may burst from an attack of sneezing or vomiting, but it is quickly reproduced. The prognosis is good, especially if the patient will submit to surgical treatment. If the cyst is large, it is impossible to determine its point of origin. In the above case one could not determine the point of origin until most of the wall had been removed. A cyst might be confounded with the so-called cystic polypi, which develop in the nose and attain their full growth in the nasopharynx. I have never seen a cystic polyp as large as the cyst described above, and they have invariably been move movable. A mistake, however, is not of much consequence, since the treatment is practically the same in both cases. In looking up the literature, one is struck with the little or no attention paid to cysts of the nasopharynx in modern text books. They have practically nothing to say on the subject. The above cyst is the only one I have seen; I did not make the diagnosis until I ruptured it in the efforts of removal. The most complete article on the subject is probably that of Escat in his "Maladies du Pharynx." A more careful study of cysts would be of great value in the early diagnosis of the condition.

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XXIV.

A CASE OF CARCINOMA OF THE MIDDLE EAR, PROBABLY ENDOTHELIOMA.

BY W. SOHIER BRYANT, A. M., M. D.

NEW YORK.

The patient was a man 41 years old, very fat, extremely nervous and painfully apprehensive. The previous history was acquired for the most part at intervals throughout the course of the disease. At the first visit the evidence pointing to malignant growth was nil, save for the unusual appearance of a polyp in the external canal. The weight of evidence afforded by a study of the symptoms favored a diagnosis of ordinary chronic suppuration of the middle ear with acute involvement of the mastoid cells. The patient said that he had a discharging ear in childhood following measles, but could give no definite account of subsequent aural difficulty until the onset of the present trouble. He had eaten and drunk excessively for many years, but had kept himself in very good physical health by constant out-of-door exercise. For the past five years he had noticed that the right eyebrow was somewhat lower than the left. He admitted the existence of a primary luetic lesion some years previous to the time when he consulted me. His brother thought that the patient had been peculiar mentally for two years or more. About a year ago the patient found that he did not hear well, and that there was a pulsation in the left ear. He had a cold in the head at that time. His brother noted that the patient had spilled a great deal of food over his clothing for some time past. The patient ten months ago first noticed pain at the top of the head. Seven months ago he noticed that the left ear was covered with "pimples" (probably herpes), which persisted for ten weeks. He remembered that he had shooting pains in and around the left ear and mastoid process, together with ringing noises six and one-half months ago. Six months ago, headaches and twitching of the face began. Three months ago the patient had severe pains in left lower bicuspid. These were pulled out and found to be perfectly normal. Very little pain was

caused by the tooth extraction, but the lower jaw felt numb. The pain in the jaw persisted. About that time he had an attack of bronchitis, accompanied by the pouring out of an abnormal amount of thick mucus from the left side of the nose, and pain and discharge in the left ear. Two months ago he first noticed that he had double vision, a condition confirmed by Dr. Arnold Knapp at about this time. Six weeks ago the patient noted that he could not hear in the left ear. A month ago facial paralysis was noticeable. Two weeks ago the patient noted that left side of forehead did not wrinkle.

Family History.—The patient's mother and two maternal aunts died of cancer of the breast. One of his sister's sons, a young man, died of malignant disease of the intestines.

Examination.—A hard, flat polypoid granulation filled the fundus of the meatus. It had an unnatural look, and was smoother, harder, flatter and paler than a true granulation, and apparently was attached to the promontory. It was not sensitive. There was a slight tenderness of the mastoid process. A fork having 512 single vibrations, when placed on the glabella, was referred to the left ear. Patient was very deaf in the left ear; he could hear no fork by air conduction below 512 single vibrations. Bone conduction was fair. The nose was not much obstructed save by slight hypertrophy and thickening of the septum on the left. He thought his sense of smell on the left was not as good as it used to be, and that the saliva did not flow as well on that side as formerly. His voice was a little thick. Tongue deviated to left. No dizziness. Pain in top of head and cheek.

Dr. Ward A. Holden examined the eyes. He found the left pupil sluggish and slightly irregular. The fundi oculi were normal. Vision 20/15ths each. Double vision, images horizontal; diminished sensation of face; paralysis of left external rectus; knee jerk exaggerated.

Dr. George S. Dixon made a blood examination and found: Red cells, 5,540,000; white cells, 8,200; hemoglobin, 90 per cent.

The differential count was as follows:

Small mononuclear.....	36.6 per cent.
Large mononuclear.....	7.8 per cent.
Transitional	3.4 per cent.
Polynuclear	51.2 per cent.
Eosinophile4 per cent.

Mast cells2 per cent.
Myelocytes4 per cent.

100 per cent.

At this time the pulse was 100 and the temperature 100.5° F. by mouth.

When first seen on August 2, 1906, the writer made a diagnosis of otitis media purulent chronica of the left ear with slight mastoiditis and nerve complications, but on the following day he changed it to syphilis of the ear because of the atypical polyp. The patient received the usual treatment for chronic suppuration of middle ear. Later on iodid of potassium was given.

During the second week of observation, the patient would not be controlled in any way. He could not sleep without twenty grains of veronal and one grain of codein at night. The left ear showed only a little serous discharge in the meatus. The polypus appeared to fill the tympanus and was most in evidence above and in front. Pulse, 80; temperature, 98.6°. There was dull pain in the temporal region, behind and in front of the ear and also in the occiput. After removal of some fragments of the growth with forceps, the stump came down and replaced the portion which had been removed. The diagnosis of malignant growth was now made, most probably sarcoma, because of the hardness.

Dr. George S. Dixon reported that a stained section from the specimen removed was negative. He said that the curettings submitted showed a mass of crystalline material—undefined in form, and hence unrecognizable—possibly cholesterin, together with general detritus such as one would expect to find in a chronic suppurating middle ear. In addition some granulation and new-formed connective tissue were present. He found nothing to indicate malignant disease, or lues. He was of the opinion that (if cholesteatoma could be ruled out) the patient had an ordinary chronic suppurative otitis with the formation of granulation tissue, some of which under favorable conditions may be converted into connective tissue.

Third Week of Observation.—Patient had pain above the left ear in temporal region. Voice thick. Inner end of canal seems to be contracting. Facial paralysis quite noticeable. Dr. Edwin G. Zabriskie noted the left pupil did not react as quickly to light as did the right, and that the patient could

not open left side of mouth as wide as right. The patient heard the tuning fork (512 S. V.) on the right mastoid process and referred it to the left ear. Paresis of facial movements least in frontalis muscle. Pulsating tinnitus. Watch not heard in left ear by air or bone. Probing growth causes pain in gums on left. Some occipital pain. Growth has entirely filled fundus of meatus since the curettement and has increased chiefly anteriorly.

Dr. E. G. Zabriskie's Examination.—Complete loss of sense of smell. Sensory innervation of face all right except left lower angle of mouth, which reacts to a prick only.

Fourth Week of Observation.—Paralytic symptoms much increased. External rectus absolutely paralyzed. Tongue is markedly deviated to left. The left eye closes voluntarily, but with difficulty. It does not wink. He can not whistle. Pains largely occipital and parietal as before. There is no feeling in temporal region back of eye. Paralysis of sensation most marked under eye. Hemianesthesia of head and considerable redness. Fork 512 single vibrations heard slightly by air conduction in left ear. Bone conduction distinctly better in left ear than in right. Touches tip of nose with tip of forefingers readily with shut eyes. Cerebration a little slow. The growth was wiped with 1-500 bichlorid of mercury, which has a retarding effect on it. It is lobulated and slightly larger than before. Muscles of mastication do not contract on left side. At this time the growth was snared and curetted and all diseased tissue that could be seen was removed. It was sessile and hard, especially in its anterior portion. The membrana tympani and malleus when uncovered appeared intact except where the membrane was torn in front by the manipulations. The growth apparently sprang from the anterior portion of the annulus tympanicus.

The bone of the inner end of the meatus and tympanic was scraped. It appeared sound. After the curettage the meatal walls were hard and intact. The walls of the inner, anterior and upper tympanum could not be examined on account of the ossicles and membrane. A few hours later the growth had been pushed out, obliterating part of inner end of canal. The end of the stump was ragged, showing that the growth had been extruded and not propagated at its periphery.

Dr. Edward G. Zabriskie's report of the histologic examination of the second specimen removed said that the

granulations showed a faintly strained stroma of compact connective tissue fibres and irregularly scattered throughout this, more particularly in the lymph spaces, were groups of round cells closely packed together, which in certain places appeared to be springing from the endothelial lining of these spaces. These cells, the nature of which it was rather difficult to determine, because of their poor nutrition and consequently poor straining capacity, appeared to be crowding along the lymph channels. In some instances they were carried along by the stream or pushed from behind and in others sprang directly from the walls of the channels. They were most probably invading masses from the central growth which was as yet quite inaccessible. There were no direct evidences of a specific granuloma in any of the sections that he examined, nor were there any of the definite vascular changes that one would have expected to find in this condition. He considered these sections as indicative of a malignant growth, and was rather inclined to consider it an endothelioma. Of course, it was quite impossible to state the origin of the growth from the evidence at hand. Dr. Zabriskie found some cartilage in the growth, which was probably a portion of the orbicular cartilage.

Dr. George S. Dixon reported that the last tissue submitted from the canal showed that the operation had been more successful in obtaining a portion of the tumor. The fragments indicated the presence of carcinoma.

The writer had the privilege of examining the sections made by both Dr. Dixon and Dr. Zabriskie, and was convinced of the correctness of their observations.

Following the removal, the patient thought his ear better, but other head symptoms worse. Valsalva's inflation negative. Walks a little unsteadily in the dark. Speech very thick. Can't drink without spilling at corner of mouth. Eye does not quite close. Left middle turbinate close to septum, but shrinks with adrenalin.

Fifth Week of Observation.—Left ear hears the low forks faintly by air. Upper forks heard chiefly by right ear.

Dr. Ward A. Holden reported pupils normal, but found a neuromyolytic keratitis.

Dr. J. Ramsey Hunt saw the case again and reported the cranial nerve symptoms unchanged. He referred disturbance of taste to the trigeminus rather than to the chorda tympani, because patient could not detect salt, sweet and sour

on the left. The palate was distinctly paretic on the left. The iodid seemed not to have any effect. He advised mercury by inunction or hypodermatically.

The patient is unable now either to sleep or to eat anything solid because of the pain. No pain in ear. There is great mental depression. Fork heard in left ear through bone from all parts of head. When the right meatus is closed with the finger he hears the fork by bone from all parts of the head only in the right ear. Pulsating tinnitus on the left. Annoying pain in the left eye, forehead, vertex, occiput and back of jaw, etc. A reflex light on growth shows a slight pulsation. Meatus fairly wide open, showing what appeared to be membrana tympani posteriorly and superiorly. Can't stand on one foot with eyes shut, but does so easily with eyes open.

Sixth Week.—Codein 1-1/2 grains and 15 grains sulphonal at night. Pain less. Meatus now completely filled at inner end. Some necrosis caused by the local application of bichlorid of mercury. The growth was coming outward along the anterior wall of the meatus. Crystal bichlorid of mercury applied to growth. More difficulty in talking and eating. Most of the pain was in lower part of forehead and about eye. Is still able to feel hard pressure on face. Paralysis of seventh nerve not quite so marked about eye. Left nares is becoming stopped with hard material. Patient said dizziness was increasing. Paralysis more marked.

Seventh Week.—Postrhinoscopic examination prevented by retraction of palate and exaggerated pharyngeal reflex, gagging and vomiting. Left nares stopped up posteriorly. Auditory meatus slowly filling from the fundus with the hard growth. Complained of more dizziness and double vision. The dizziness is probably from the double vision in eye. Convergent strabismus of left eye noticeable. Postnasal digital examination found the end of left inferior turbinate. A soft uneven surface lay above it, but was out of definite reach. Tears flow on left cheek. Metallic taste in mouth has been marked. Left pupil a little larger than right, it reacts to light and accommodation. Patient extremely fearful of death or operation. Dr. Holden could note no change in the eye.

Eighth Week.—Operation under ether. Made the usual postaural mastoid incision. Removed the posterior, upper and anterior wall of the osseous meatus. Both bone and soft

tissue with the malignant growth were stripped from the walls and the tympanum and Eustachian tube were cleaned. The dura mater of the middle and posterior fossae was fully exposed. It appeared perfectly normal. Washed out with cold saline; packed the meatus lightly with iodoform gauze. One deep suture and metal clamp external suture. The growth was not attached anywhere except in the fundus of the meatus anteriorly, and in the Eustachian tube. It did not appear to involve the bone. No lead could be found in any direction. The operation did not continue to the apex or the pyramid because the patient had absolutely refused to allow any intracranial exploration.

Ninth Week.—First day of convalescence. Changed outer dressings. Much depressed at times. Consultation with Dr. Charles H. Knight about swollen tongue from injury during anesthesia. Second day: Paralysis of facial and chorda tympani seemed better. Less metallic taste in the mouth. Less facial paralysis. Orbicularis of left eye acts strongly. Dressings only slightly stained. Changed packing in the meatus. Removed the metal skin clamps. Wound healing by first intention. Third day: Wound firm and solid. Changed gauze in the meatus. Fourth day: No sign of suppuration in ear. Sixth day: Facial paralysis marked. Eye does not close. Pain has been bad again. The fundus of the canal nearly healed. It has collapsed somewhat at bottom. Slight serous discharge. When the fundus of the ear was wiped, deep pain was felt in jaw at the place of the tooth extraction.

Tenth Week.—Seventh day of convalescence. Some pain in brachial plexus, relieved by chloroform liniment. A growth is visible in the meatus on the inner anterior wall in about the former position. Removed the excrescences with forceps. Eighth day: Slept well. Feels pretty well. In consultation Dr. C. L. Dana suggested a basal cranial radical operation. Growth in meatus spreading and meatus narrowing. Ninth day: The lumen of the meatus filling up with growth. The growth on floor of meatus moves with movement of jaw. No dizziness can be detected. Dizziness increases on moving about. Has a subjective feeling of pressure at the vertex. A cotton plug saturated in 1-1000 corrosive sublimate worn in the meatus. A brawny swelling on junction of left hard and soft palates. Left nose still more occluded. Tenth day: Complains of feeling of weight on head. Consultation with Dr. Emil Gruening. He thinks growth located at apex of

pyramid and that it could be removed. Twenty-five mgr. radium bromid of 1,000,000 radio-activity exposed in meatus for thirty minues. Eleventh day: Radium forty-five minutes. Growth has considerably increased in meatus. Thirteenth day: Radium thirty minutes. Slept well. Ear looks a little smoother and cleaner. One two-hundredths bichlorid wiping. Iodid of potassium disturbed stomach and was discontinued.

Eleventh Week—Fourteenth Day.—Dr. E. D. Janeway consulted. He said that there was paralysis of the ninth nerve. Patient hears all tuning forks from all parts of the head in left ear. Fifteenth: Radium twenty-five minutes. Meatus filling in slowly with smooth hard masses. Transillumination shows large clear frontal sinus and antrum. The left antrum seems to glow more than right. Sixteenth day: General condition better. Nasal breathing worse. Pain in gums of lower jaw and left side of nose. Seventeenth day: Face seems to show more motion. Occipito-frontalis moves a little. Adrenalin opens right nose completely; left nose shrinks anteriorly but not posteriorly. Pain chiefly in lower jaw, where tooth was pulled, a little also in nose and cheek. Radium fifty minutes. Ear seems to have closed little since last observation. Eighteenth day: Consulted Dr. Joseph Collins. He advised immediate radical operation. Ear looks a little better. Double vision, sees an object to one side and above the other object. Ataxia slight. Nineteenth day. Radium seventy minutes. Morphin. Pupil's large. Fundus of ear now open and pale. Twentieth day: Consultation with Dr. J. R. Shannon. He said that there was slight commencing optic neuritis. Corneal irritation was due to facial and trifacial paralysis, and to external applications for eye pain. Diminished visual field. External rectus the only eye muscle affected. Slight convergent strabismus. Subcutaneous use of bichlorid of mercury discontinued. Pain in face very bad last night. Pulse, 100; temperature, 99°.

Twelfth Week.—Vomiting. Feels worse every day. Pain continues to increase in whole side of head, face and neck, temples and vertex. Eye and gum pain the most intense. Feeling of weight over left vertex. Pain not controlled by morphin. Almost sleepless. Voice quite husky. Left nasal fossa closing fast. Probe will not pass. Left pupil smaller than right, sluggish and reacts little.

Thirteenth Week.—Consultation with Drs. Harvey Cushing, Joseph Collins and J. B. Walker. Dr. Cushing said that he had operated on several similar cases. He thinks the ear growth had nothing to do with the paralysis; that the paralysis of fifth and sixth cranial nerves and the pain were due to pressure on the Gasserian ganglion; that the growth closing left nares has penetrated skull and lifted Gasserian ganglion and at same time pressed on seventh nerve. Thinks removal of Gasserian ganglion would relieve pain. Said the ophthalmic and pupillary disturbances are due to contiguity of the nerves, and that the lingual and facial paralysis are only apparent and are due to loss of muscular sense. Said optic disc showed changes. Patient complains of most pain in vertex and left side of head. Slept little and ate less. Occasionally says the wrong word for things. Much vomiting.

Fourteenth Week.—Fundus of meatus filling slowly or collapsing. Pain in occiput. Worst pain in lower jaw and eye. constant. Eye red; exophthalmos, trophic conjunctivitis. Excoriation of left brow, nose, lip, chin and gums from picking with finger-nails. Losing weight fast. Nose more stopped, full of bloody mucus. Swallows into trachea. Ear unchanged. Consultation with Dr. F. H. Bosworth, who said there was paralysis of left recurrent laryngeal nerve and left vocal chord; that is, paralysis of left pneumogastric and glossopharyngeal nerves. Said there was paralysis of the left palati. Also an enlargement on the posterior end of lower turbinal.

Fifteenth Week.—Failure of physical and mental strength is marked. Left nares constantly full of thick mucus, which is very annoying, as he cannot dislodge it. Since operation has had no pain in or about the ear; pain chiefly in eye, gum of lower jaw, in nose and side of nose. More pain now in vertex and occiput. Fundus of auditory meatus filling up slowly, probably collapsing. Soft palate as seen by mouth has an antero-posterior furrow with bulging on each side, most marked to left, hard on left side, soft on right. Patient often chokes from inhalation of saliva and food. Fear of choking makes him sleep in the erect position. Had a hard lump in left anterior supraclavicular region.

Sixteenth Week.—Ear remains dry. Palatal induration extending to right side. Pulse weaker, rate as usual. Ear filled up about as much as before operation. Physically, a little weaker, mind a little better; ear, eye, nose and throat dry.

Some enlarged glands under angle of left jaw. Thickening in palati region is increasing and extending. Pain in eye, gum, cheek, left parotid and lumbar region. Feels feverish.

Seventeenth Week.—Nose still further occluded. Palate a little fuller. Has had "sticking" pains in vertex of left nose and a little in left ear. Gums of upper left molars ulcerating on inner side. No bone conduction in left ear. Tuning fork not heard on left mastoid, but is heard on right. Complains of dry throat. Left nares contains bloody, thick mucus. Left pupil smaller than right. Right pupil dilated. Says morphin does not stop pain unless it stupefies him, but it lessens it.

Nineteenth Week.—Has had a large lump in lower carotid triangle for a week. Much severe pain, fifteen grains and more of morphin daily. Regurgitation through nose. Losing strength rapidly, weight not much changed.

Twenty-second Week.—Looks as if he had lost more weight. Is very despondent. Twenty-five grains of morphin daily. Facial and other paralysis more marked. More exophthalmos. Hard lump over masseter muscle, left angle of jaw, below jaw and at level of cricoid cartilage. Palate growth larger, more prominent and red. Anteriorly, it is pale and shows dark brown ecchymosis. Speech more difficult and exhausting.

Twenty-fourth Week.—Had violent attack of dyspnea at stool. More than fifty grains of morphin daily. Pleuritic effusion on left.

The courtesy of Dr. C. R. Putnam, who had charge of the case toward the end, provides us with the following notes: The patient took large quantities of food. At first he swallowed into the trachea, because the throat was anesthetic, but he finally learned to swallow without difficulty. He had a metastatic growth in the mediastinum, which pressed the trachea to the right, causing orthopnea for several weeks before death. He had severe thoracic pains, took fifty grains of morphin daily. Atropin, strychnin and nitroglycerin were used when indication presented themselves.

Twenty-sixth Week of Observation.—January 21st: Died after three days of dyspnea. Did not get out of chair or go to bed for fear of choking. Used chloroform to ease severe dyspnea. Loss of weight had been slight of late. Weight about 200, formerly about 230. Death occurred from thoracic rather than from intracranial causes. The ear had remained cicatrized to the last. Submaxillary lymph glands hard and as

large as pigeon's egg. Swelling on ramus of left lower jaw. Largest single dose of morphin was twenty-six grains.

SUMMARY.

CHRONOLOGICAL SEQUENCE OF SYMPTOMS.

Running ear. Right eyebrow drooped. Mental change. Decrease of hearing in left ear and tinnitus. Pain in vertex. Herpes of the ear. Pain in and about the ear, headache, twitching of face. Severe pain in teeth and numbness of jaw, first noted trouble in the nose. Double vision. Total deafness left ear. Marked facial paralysis.

ANALYSIS OF SYMPTOMS.

The ear had been affected many years when mental changes were noted. Functional disturbances of the ear. Painful symptoms in the vertex. Herpes of the ear indicating nerve lesions near the geniculate ganglion (Hunt). General headache and pain in and about the ear, functional disturbance of facial nerve. Functional disturbance of fifth nerve and disturbed nasal function. Disturbance of the external rectus.

ANATOMIC EFFECTS.

We have followed the history of a cranial lesion first definitely affecting the function of the ear probably by encroachment on the tympanum near the orifice of the Eustachian tube; next it is located in the neighborhood of the geniculate ganglion; there is definite facial nerve affection; definite affection of the inferior maxillary branch of the fifth nerve and disturbed nasal function; paralysis of the sixth nerve supplying the external rectus. This lesion progressing from the tympanum and Eustachian tube, encroaching on the geniculate ganglion and causing definite motor disturbances of the facial nerve, progressed inwards, affecting the inferior branch of the fifth nerve and then forwards and down along the Eustachian tube, appeared in the posterior nasal fossae, and traveled backwards and downwards, affecting the sixth nerve. The involvement of the other branches of the fifth was probably caused by involvement of the Gasserian ganglion. The paralysis of the tenth and eleventh cranial nerves was affected by the spreading of the growth down-

ward and backward along the basilar process of the occipital bone. Metastases were all in the anterior triangles of the neck or in the mediastinum.

The etiologic importance of syphilis was probably nil. There was a very strong malignant inheritance.

COURSE, DIAGNOSIS AND TREATMENT.

The course of the disease was about two and a half years. The more definite period was about eighteen months. The marked symptoms lasted about six months, the grave symptoms about three months.

The case was an important one. The patient consulted eighteen specialists and received every care and attention possible.

The definite diagnosis was delayed for some time after the patient was first seen on account of his extreme horror of anything in the nature of an operation. This attitude prevented satisfactory microscopic examination of the growth. He utterly refused to submit to any more operating.

The long interval which elapsed between the commencement of the first symptoms of the growth and its exenteration was too great for a simple removal. At the time of operation it was far too extensive to have been eradicated by the tympanic operation. The result of the operation was a lessening of the discomfort referred to the ear and apparent cessation of the growth in the ear. This good local result, the author believes, was due to the post-operative use of radium.

The result of the operation suggests the possibility of a successful total extirpation if an operation could have been performed when the symptoms were first definitely noted.

The final course of the disease made it clear that an extensive radical operation would have made the last days of the patient more comfortable, if not more numerous. Unfortunately, however, he would not submit to it.

ATROPHIC RHINITIS: ETIOLOGY AND TREATMENT.

BY JOSEPH C. BECK, M. D.

CHICAGO, ILL.

It is the article of Richards, read at the last meeting of the American Medical Association, that prompts me to bring this subject for your discussion for two reasons: First, he appeals that more attention be given in our medical society meetings to this most discouraging chapter in rhinology; and, secondly, he ignores, in a measure, the sinuses in relation to atrophic rhinitis.

I will say at the outset that, believing that the sinuses and their involvement, whether primary or secondary, have much to do with atrophic rhinitis, I do not consider it to be the most discouraging chapter in rhinology. It is my purpose to report a number of cases of this affection in which radiographs were taken to determine the involvement of the various accessory sinuses of the nose. This fact was proven by operation. I also wish to report in connection with these cases, which are twenty-four in number, several methods of treatment which have not been brought out very extensively in the literature, some, so far as I am able to find, original and of benefit in this affection.

The literature on atrophic rhinitis is so vast that I shall not take it up, only in so far as it relates to cause and treatment, and that very briefly.

Zaufal, Heymann and Hopmann are of the opinion, based on many investigations, that the cause lies in a congenital atrophy of all the bones of the nose, and in a lack of vitality of the mucous membrane. These individuals are, as a rule, predisposed to catarrhal conditions.

E. Fraenkel, Loewenberg, Abel and Hajek have found the *cocca-bacillus* and the *bacillus mucosus* as the probable cause of this affection. Schlafrig ascribes it to the *sarcina*, and Bel-

fanti and della Vedova, to the pseudo-diphtheria bacillus. One of the most interesting observations is that of Perez, carried on at the Pasteur Institute, where he claimed to have found the pathogenic microorganism called the *cocca-bacillus foetidus ozenae*. He injected pure cultures of these microorganisms into the veins of a rabbit, and produced marked atrophic changes in the anterior turbinated body, which corresponds to the inferior turbinated body of man, when examined histologically.

Most authors still believe that the primary cause is some violent infection of the nose, such as accompanies scarlet fever, measles, diphtheria. A chronic hypertrophic condition appears and on account of general malnutrition, with the eventual development of the specific microorganisms on such good soil, the atrophy develops and goes on rapidly or slowly, according to the resistance of the tissues and medical interference.

Zarniko believes that this affection is due to a trophoneurotic change in the mucous membrane and bone. Stoerk believes that congenital lues or gonorrhea in the parents is responsible for many cases.

Recently much attention has been given to the involvement of the sinuses and their chronic discharge as being responsible for this affection. Michel, Hajek, Grünwald and many others are of this opinion.

Post-mortem examinations made by Wertheim, Oppinkor, Krause, Hartmann, Harke and Fraenkel would all disprove that the sinuses have anything to do with the causation of atrophic rhinitis. Grünwald, Hajek and others, however, answer them by saying that, as a rule, anatomists do not make a very careful examination of these cells, and that in many cases the mucous membrane does not show great microscopic changes. Again, it is not necessary that all or many cells need be affected. One or two of the ethmoidal cells only on each side can cause an atrophic condition. From my reading of Hajek's twelve cases and his deductions, I am convinced that atrophic conditions can be caused by affections of the sinuses. Besides, he has reported two cases of marked adenoid hypertrophy with atrophic rhinitis, removal of which was followed by marked regeneration of atrophic condition. This regeneration he observed in most of his cases of partial atrophy when he cleared away the sinus disease. He believes that the atrophic condition develops when the tenacious discharge

is deposited over the inferior or middle turbinated bodies; here it causes destruction of the cellular elements; the epithelium develops in marked stratification; there is a secondary contraction of the underlying connective tissue with a vascular anemia and starvation, finally causing bony atrophy. He absolutely denies that the discharge usually found in the nose in atrophic cases is secreted by the turbinated body, as claimed by Zuckerkandl.

Chiari is absolutely against the assumption that sinus diseases cause this affection, and brings forth the claim that atrophy occurs in children as young as two and a half years old; one cannot certainly expect that this large amount of discharge can come from the extremely small accessory sinuses of children.

D. Braden Kyle writes very exhaustively on the subject of causes and classifies them particularly from the pathologic point of view. As to the sinuses, he says they may be primarily or secondarily involved. No credit is given to the bacterial cause of this disease.

General constitutional diseases, according to this author, are responsible for many cases of atrophy, such as syphilis and tuberculosis, and atrophy is frequently associated with kidney, heart and lung diseases, causing an over-abundance of blood (passive congestion), with secondary contraction and final atrophy. He also believes in a trophic cause of atrophic rhinitis. Much stress is laid on the difference between atrophy and degeneration. The former occurs first; degeneration second.

So far, then, nothing has been said as to radiograms estimating sinus involvement in this disease, and the consistency of bony structures of the turbinate and other bones of the face.

The technic of taking radiograms in this disease is the same as when we wish to determine sinus diseases. I have always made two exposures, one lateral and one anterior. The patient's face is put directly on the plate and immobilized by a compression apparatus, and he is instructed to be absolutely quiet, not even to breathe or move the lids for sixty to eighty seconds. This is accomplished by the patient signalling with his finger when he cannot hold his breath any longer; then the current is severed and the patient is again allowed to breathe, and the procedure is repeated until the full length of the exposure is made. The lateral view is exposed for from fifty to sixty seconds, and the antero-posterior for eighty

seconds. The tube is placed back of the head about fourteen inches from the occiput. The plate is developed in the usual photographic manner, and after it dries it is examined by means of transilluminated light in a dark room. The plates are of diagnostic value, while the prints of them are, as a rule, very unsatisfactory, an unfortunate fact regarding the publication of the plates. The antero-posterior views are best for judgment of the frontal, antral and anterior ethmoidal sinuses, while the sphenoid and posterior ethmoid can only be seen in the lateral view. However, the superposition of the two sides makes this view not very satisfactory for diagnosis, except in connection with the physical examination.

The involvement of a sinus is judged by its density; while I am not absolutely certain that the skiagraph is true in every instance, it is, in the majority of cases that I have examined and opened. The cavities are shown as dark areas, whereas when filled with pus, thickened mucous membrane or granulations, they are shown as whitish areas, similar to the surrounding solid bone.

Of the twenty-four cases of atrophic rhinitis that I radiographed, I found the sinuses involved in all but three cases, and these were of the light type of atrophy.

TREATMENT.

Most of the authors treat the symptoms of odor and obstruction, due to the crust formation, and only the minority consider the pathology in this regard. Hajek, Grünwald, Braden Kyle and Onodi are some of the latter, and it seems their results are much better. Personally, I am of the opinion that the condition may be primary in the nose or sinuses, but that in the majority of cases, when treatment is directed towards these accessory cavities, in addition to the nasal and general treatment, the results are better. The literature is full of cures and marked benefits from ever so many different methods of treatment, and that fact alone is enough to show that we have no specific treatment applying to all cases. The essential fact, I believe, as to the treatment is to remove the cause and then establish hyperemia, which will be followed by resolution, either partial or complete.

As to the methods of treatment that I have followed in my cases, I will report specifically in each group, for I have divided them up into six groups so as to be able to control my experiments. The methods were:

1. Irrigation in the areas of the ostea of the various sinuses, or of the sinuses directly by means of a solution composed of iodine, formalin and sodium chlorid; associated with the suction method, as recommended by Sundermann or Brawley.

2. Operative interference, usually intranasally, by removal of the middle turbinated body, curettement of the ethmoid cell, removal of the anterior sphenoidal wall, and a large opening into the antrum of Highmore at the inferior meatus, with or without the removal of a portion of the inferior turbinated body. I do not need to say that in each case all these sinuses were so operated on only when absolutely indicated.

3. Paraffin injections into the inferior turbinated body.

4. The use of high frequency current into the nasal and pharyngeal spaces.

5. Bier's treatment, such as constriction band around the neck, and Rethi's method of compression at the posterior choanae and Sundermann's method of constant suction.

6. Vapor therapy, by means of the Bulling's vibrator, using the same solution as for irrigation, only stronger.

I have come to some definite conclusions as to the value of these various methods of treatment, and will report in detail, as said before, in connection with each group of cases.

From the foregoing, it will be apparent that my treatment is principally directed to the sinuses. All other treatment is used to promote resolution or restitution of the atrophied structures by means of hyperemia and leucocytosis.

These twenty-four cases were divided into groups in order to be able to judge and compare the various methods of treatment, and each group of cases will be reported by taking one typical case as an example.

GROUP I.—SEVEN CASES.

Case I.—Miss M., 17 years old. Father and mother and six brothers living and well. None have any trouble like the patient's. She had the usual diseases of childhood. Ever since she can remember she has had trouble in her nose, as discharging of accumulation of crusts of a foul odor. She herself cannot smell them. Suffers much with headache, and is frequently dizzy. Her throat is constantly dry, making her cough, especially in the morning. Her appetite is markedly diminished. There has never been any ear trouble.

Status—Poorly nourished young woman; very anemic. Blood examination shows a lack of hemoglobin, and diminution of red blood corpuscles. Urine negative. Nothing pathologic, apparently, in the gastro-intestinal tract, heart and lungs, and genito-urinary tract or the cerebro-spinal system.

Nasal examination shows a bilateral atrophy of the inferior turbinated bodies, with apparently enlarged middle turbinated. Membrane of the whole cavity of an anemic character, with minute ulcerations scattered all over the cavities. Posterior wall of pharynx and Eustachian orifices are clearly seen through the anterior nares, and appear very dry. There is no pus escaping from any of the ostea. Epipharynx and mesopharynx are dry and apparently thinner than normal. Larynx and trachea negative. Ears negative.

Examination of eyes: No fundus lesion, only a hyperopic astigmatism; 0.50 D.

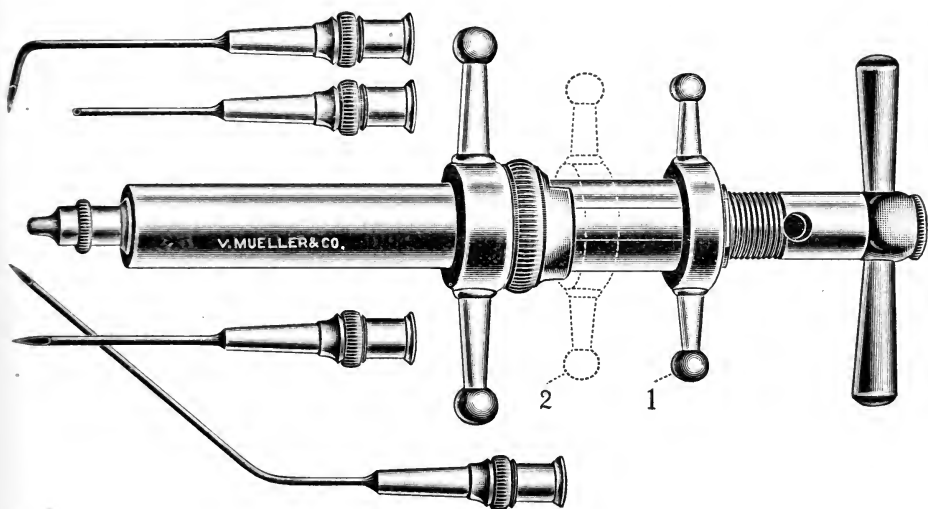
Radiogram—Shows involvement of all the sinuses, in being almost as dense as the surrounding bones. Transilluminations dull.

Puncture of the antrum revealed pus of a thick greenish color.

Diagnosis—Atrophic rhinitis and pharyngitis, associated with a pansinusitis.

Treatment—Washing out of the sinuses by means of canulas introduced into them, or in the vicinity of the ostea, using an irrigator placed ten feet high. The fluid used was a very warm iodine-formalin-salt solution. This is followed by tilting the head forward and backward to the right and left, so facilitating the emptying of the sinuses, and then using either the Sundermann or Brawley suction apparatus, for the purpose of aspiration (Bier's treatment). Only slight improvement followed this sort of treatment, and an operation was suggested of removal of the middle turbinal, with ethmoid, sphenoid and antral sinus puncture. This was accepted and done. The result was a recovery from this operative procedure, and a marked improvement in the general condition of the nasal mucosa, marked reduction of the odor, and her general condition markedly improved. Seven weeks later, a bilateral in-

jection of paraffin (cold) was done with a syringe (see figure), with a very good result of bulging of the inferior turbinated body.



Remarks—This case shows that the treatment of the sinuses was the proper procedure. The irrigation fluid of formalin, iodine and sodium chloride is one of the best for the purpose of irrigation in this infection of which I know, and I believe the iodine acts as a particular stimulant to healthy surfaces. The paraffin is supposed to act beneficially by reconstructing the inferior turbinate, but I believe that it also acts as a nutrient or stimulant to a healthier and better blood supply, because, as I will show in other cases, much improvement followed by simply injecting a quantity not large enough for reconstruction.

The other six cases are about the same, varying in the history and general examination somewhat, but, as a whole, required the same kind of treatment and gave about the same result. It is to be observed that irrigation and aspiration treatment was tried before for a period of from six weeks to three months, but, in all these seven cases, operation was performed by the intranasal route.

GROUP II.—FOUR CASES.

Case I.—Miss C., aged 22. Father died at 53 of kidney trouble. Mother and three sisters well, and none have any trouble like patient's. She had the usual diseases of childhood, but not scarlet fever. Ever since she can remember she has been discharging crusts from the nose, of a foul-smelling character. She can smell fairly well. Her general health is always good. Has been under treatment by a general practitioner, who directed her to wash her nose out with salt solution in the usual manner of snuffing the water, and he applied nitrate of silver, 10 per cent, also packed the nose with tampons of wood wool, without any result. Never has had any ear or throat trouble.

Status—Well nourished young lady, and in apparently perfect health. Nasal examination showed atrophy of both inferior turbinated bodies. The middle turbinate looked much thinner than normal, and the sphenoidal sinus, osteum maxillare and naso-frontal duct were easily probed. The general mucosa was of an unhealthy character. The postnasal space and Eustachian orifices were plainly seen through anterior nares. The mucous membrane of the epipharynx and mesopharynx, as well as the larynx and trachea, were normal. Ear and general examination negative.

Radiograph shows the sinuses plainly involved, but not so markedly as in Group I.

Transillumination, practically dull. Puncture of antrum negative after irrigation.

Diagnosis—Atrophic rhinitis, with some involvement of a mucous type.

Treatment—Irrigation of the sinus with the various canulas, using the iodine-formalin-salt solution. Aspiration of the sinuses. Cold paraffin was injected into both inferior turbinated bodies, and it appeared as though the condition improved from the moment the paraffin was injected.

Remarks—The other three cases were almost identical, and the results are the same. These four cases are all of more than one year's standing, since treatment was instituted, and what I say of their improvement is from my recent observation of them. The crusts and odor are not present at any time, and the patients do not complain, except on a cold day, when they feel too much cold air rush into the throat. There is no washing or treatment done at home, and only general hygienic measures are observed.

GROUP III.—FOUR CASES.

Case I.—Mr. V., 25 years old. For the past two years has been under the treatment of a general practitioner for a hacking cough, taking medicines without any result. His family history is good. He has been well until the above mentioned time, and does not remember of ever being very sick or having had bad colds. For the past few months there have been crusts forming in his nose, and his folks complain of an odor, but he cannot smell it. His throat is very dry, and a thick crust forms in the back of his throat, that he thinks makes him cough.

Examination—General examination of heart, lungs, gastrointestinal tract, kidneys and blood, negative.

Nasal Cavity: Nostrils filled with casts of crusts. Both inferior turbinated bodies partially atrophied. The middle turbinate body is thickened and covered with a thick, viscid, muco-purulent secretion. The epipharynx and mesopharynx and false vocal cords are deeply inflamed, and small crusts are formed on the latter. The larynx and trachea are also injected and red. Sputum examination: negative as to tubercle bacilli, but mixed staphylococci and bacilli were found. Lots of pus cells. Suction does not reveal any pus from sinus.

Radiograph negative, except that the ethmoid sinuses look a little cloudy.

Puncture of antrum negative.

Transillumination negative.

Diagnosis—Atrophic rhinitis, with epipharyngitis, mesopharyngitis and hypopharyngitis.

Treatment—Inhalation of vapor generated by the Bulling's vibrator, using a nasal tip for the nasal treatment, and mouth tip for the throat inhalation. The fluid used was the same as the irrigation fluid. Treatments were given three times a week, for ten to fifteen minutes, and each sitting or treatment continued until crusts and odor disappeared.

Remarks—These four cases may be classed in one group, because they all give a history of late manifestations of this trouble. They are all negative on radiographic examination. They are all practically free from headaches, and the atrophy in them all is only partial. They all got well by means of this treatment, and I only wish to say that in cases where the throat is involved, particularly the larynx, this treatment is of distinct amelioration to the patient.

GROUP IV.—TWO CASES.

Case I.—Miss M., 26 years old, nurse. For several years has had trouble with the right side of her nose, crusts forming which are of a very foul odor. Her head aches on that side very much, and she cannot see so well with the eye on that side. Her family history is negative, and she only had the grippe when she was a little girl. Since then she believes this trouble began. She has been using the douche cup for a long time, but her ears get so bad when she does so that she has abandoned that. When removing the crusts she has frequent nose-bleed. General examination negative, except a goiter.

Status.—*Right Side of Nose.*—Almost complete atrophy of inferior turbinate. Crusts and pus in the nose. A streak of the pus going back into the throat from about middle turbinated body. This body is very large, and the characteristic outgrowth of sinus disease springs from the region of the hiatus semilunaris.

Left Nostril.—Slight hypertrophies, but otherwise negative.

The throat is covered with a purulent secretion, especially post-nasally and on the right side.

Puncture of antrum. Washed out thick pus.

Transillumination: Distinctly dull on right side.

Radiograph: Very distinctly shown to be ethmoidal, and antral trouble in the density of the structure. The frontal appears clear.

Eye examination showed dilated pupil; paralysis of the sphincter pupillae. No fundus lesion. Vision 20/50, and does not improve.

Diagnosis.—Unilateral atrophic rhinitis, associated with unilateral sinus disease.

Treatment.—Complete exenteration of the antrum, ethmoid and sphenoid on right side, with the happy result of absolute relief from the headaches; the discharge and crusts less; the odor markedly diminished, and the bleeding, which, by the way, required post-nasal packing on several occasions, has entirely ceased.

Remarks.—This case would certainly prove that sinus disease can and does cause atrophy. The second case is almost the same, except that the radiograph is confusing, and shows, if anything, trouble on the healthy side. I am of the opinion, however, that the fault lies in the technic.

GROUP V.—THREE CASES.

Case I.—Mr. B., aged 43, laborer, single. Denies all specific history, and says he has been fairly well, with the exception of nasal and throat catarrh. Has considerable headache. Cannot see well, and has been cross-eyed for some time—about fifteen years. For the past two years has had much trouble with his throat, being compelled to cough up small, dry pieces, which require great effort. His throat and nose feel very dry at all times. Every winter, if he is exposed the least bit, he has a severe bronchitis, and once he had a pleuro-pneumonia. The crusts are not so marked of late as they formerly were. Hears poorly, and has head noises.

Status—Fairly well nourished man, whose lungs and heart are negative. Also urine and blood examinations negative.

Nasal Cavities—Double atrophy of inferior and middle turbinates. The mucous membrane of the naso-pharynx and larynx appears atrophied. The vocal cords and below them in the ventricle, and even lower into the trachea, can be seen small, dirty-looking crusts. Both tympanic membranes are markedly retracted.

Transillumination: Fairly good light through the pupils.

Radiograph: All sinuses cloudy.

Puncture of antrum negative on washing out.

Diagnosis—Double atrophic rhinitis, pharyngitis and laryngitis, and tracheitis. Otitis media catarrhalis chronica.

Treatment—Bier's constricting band about the neck, low down, worn twenty-two hours out of twenty-four, and Rethi's method of compressing the veins in the posterior choanae by holding a perforated rubber plug in this position for twenty-four hours, changing from right to left each day.

Remarks—The other two cases are of the same character, and are treated in the same manner. The time is too short to say much about the results, as the patient has only been under treatment for about three months. However, without hesitation, I can say that the symptoms of dryness are markedly lessened, and the general appearance of the mucous membrane is certainly of a healthier character.

GROUP VI.—FOUR CASES.

Case I.—Mrs. E., 35 years old, married; six children. Has for years been troubled with a dry nose and throat, and foul-smelling crusts are discharged after a great deal of effort, and

soaking in salt water. The ears are very frequently stuffed after this sort of treatment. Family, childhood and adult history negative, except that she has always been very nervous.

Examination, generally, showed nothing of importance, pathologically.

Nasal fossae: Atrophy of both inferior turbinates. The upper parts of nose are covered with small crusts and a very tenacious secretion. Pharynx is dry and glossy. Tympanic membrane retracted. Hearing reduced to about one-half.

Radiographs show cloudy sinuses.

Treatment—Exclusively daily application of the high frequency current to the nasal and pharyngeal mucous membrane. The method of applying is as follows: A resonator is used for the production of the high frequency current, being supplied by an eighteen inch coil. A glass electrode extends from the resonator, which is introduced into the nose or throat, as the case may be. After the electrode is introduced, the current is turned on and is permitted to remain at first one minute, and gradually increased to three minutes. The strength of the current is also graduated, at first light (second or third ring of the resonator), and gradually raised to the third or fourth. This treatment is carried on daily until a reaction results, something like a coryza. Then stop and wait until all irritation disappears, when the treatment is renewed, and at this time more toleration exists. It is kept up every day for one to two weeks, and then gradually every other day, etc. No other treatment is associated with it.

Remarks—All the four cases were of about the same nature, and treated in the same manner. More than two years have passed since the first case was treated by this method, and I am sure that the condition was very much improved. You understand, that these are cases on which I either did not want to operate, or was not permitted to do so.

There is another diagnostico-therapeutic experiment that I should like to report in connection with this subject namely, the use of dionin. I do not intend to go into the details of the chemistry of this substance, only saying that it is a morphin derivative. It is a sedative, but when applied to the conjunctiva, causes an artificial edema of varying degree. It is used in ophthalmology very extensively as a therapeutic agent to clear up acute as well as chronic inflammatory products. I have, therefore, argued from analogy that if it acted

in other parts of the body as it does in the eye, it would be of benefit in atrophic rhinitis; first, by causing edema, it would show whether the connective tissue is very firmly adherent to the bone or not; and, secondly, acting as it does on the eye, it would assist in absorption of chronic inflammatory products.

I have tried it on almost all the cases, and on some normal and other conditions, with such variable results that I shall be satisfied at this time simply to put the experiment on record, and say that it acts on certain individuals and not on others. It is a toxic substance, and should be used with care, although I have never had the least trouble from its toxicity, even when injecting it into the middle ear through the tympani membrane.

CONCLUSIONS.

1. That the sinuses are very frequently involved in atrophic rhinitis; whether primarily or secondarily is not always possible to determine.

2. That when the sinuses are involved the atrophy must have some other cause, as, for instance, bacteria, heredity, etc., for we find so many sinus troubles with hypertrophy.

3. That radiographs are an aid in diagnosis, and should be practiced by every rhinologist.

4. That treatment directed to the sinuses is followed by improvement, much more readily than when they are not treated.

5. That surgical intervention, preferably intranasal, gives the best results.

6. That the results of local treatment, as by tamponing, massage, electricity, vapor therapy, paraffin injection, Bier's treatment, etc., are brought about by the production of hyperemia and leucocytosis, bringing about an altering condition, and possibly a resolution or restitution of glandular structures, normal mucous membrane and even some of the erectile tissue.

92 State St.

XXVI.

A STUDY OF EAR SYMPTOMS IN ARTERIOSCLEROSIS WITH SPECIAL REFERENCE TO THE LABYRINTH.

BY JOHN J. KYLE, *M. D.*

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For a number of years, we have firmly believed that the early and late ear symptoms, as observed in general arteriosclerosis, are worthy of greater consideration, not alone as disagreeable complications of this growing disorder, but as early and important symptoms in the diagnosis of the disease. My conclusions have been verified upon those suffering from arteriosclerosis in both middle life and old age. Since having our attention directed in this channel by experience and also by the contributions on the subject by Alexander¹ in 1902, an instructive monograph, entitled, "Arteriosclerosis of the Labyrinth and Nerve Centers," by E. Escat² of Toulon, has appeared.

Otologic literature is singularly quite barren in regard to the ear symptoms in arteriosclerosis. I can accentuate an opinion quite freely expressed and believed, that many ear symptoms, too often considered as purely local, are the local expression of a general disease. Therefore, a tinnitus and slight deafness, with slight loss of bone conduction, may be of far deeper significance than simply disease of the perceiving apparatus, and for this reason, we should go deeply into the etiology of slight deafness, possibly thereby blocking the march of a general disease, which may ultimately harass, if not annihilate the individual.

Progressive loss of bone conduction in individuals of advanced years, has heretofore usually been considered as being due to structural change in the bone, that is, a sclerosis, the result of age. I cannot but believe that this is advisedly speaking somewhat fallacious, and that the loss of bone conduction is primarily due to change in the blood vessel walls, and secondarily, to a nutritive change in the temporal bone from faulty blood supply.

We frequently find bone conduction normal in people of advanced age who are free from arteriosclerosis. However, in forty consecutive cases with typical pipe-stem arteries, varying in age from sixty-two to one hundred years, inmates of the National Home for Disabled Volunteer Soldiers, Marion, Indiana, loss of bone conduction was present in every case. The general average bone conduction, T. C. 512, normally heard for twenty seconds was seven seconds in the right ear and eight seconds in the left.

To make myself perfectly clear in the beginning, we do not propose to consider arteriosclerosis as an accompanying condition of old age, as in the class mentioned, but confine our remarks to the disease as observed in the productive stage of life, that is, in individuals ranging in age from thirty to fifty years.

The youngest case of arteriosclerosis examined showing loss of bone conduction, was aged twenty years. The diagnosis of general arteriosclerosis was made by Dr. Wynn, of Indianapolis.

The theory of sound conduction is quite thoroughly discussed by Boenninghaus, (*Archives of Otology*, October, 1906²) The transmission of sound waves through the conducting apparatus, especially by mass or molecular movements, is interfered with if there is a sclerosis of the arteries of the temporal bone. The hardened arteries cannot take on a similar and simultaneous movement with the surrounding bony structures and in consequence, the movement is retarded and bone conduction is thus correspondingly diminished. There is also a coincident faulty metabolism of all the bony structures, corresponding to the amount of disturbance in the arteries of the temporal bone and middle ear. The perceiving apparatus may undergo a similar and probably earlier degeneration contemporaneous with the arterial change in the basilar artery, which will be explained in a consideration of the pathology of the subject. The intensity of air and bone conduction depends primarily upon the density of the bony structures, which is controlled by the blood supply, and secondarily upon the perceiving apparatus.

For a better understanding of the relationship between the ramifications of the arterial blood supply and the auditory nerve in its peripheral and central endings, it is necessary first to refer briefly to the anatomy of the nerve.

The auditory nerve takes its origin in the bipolar ganglionic cells within the internal ear, joins the brain at the lower border of the pons varolii, and subdivides into two parts, the vestibular and the cochlear nerves, which envelope the restiform body. The cochlear nerve, which is the true nerve of hearing, sends its fibers to the lateral cochlear nucleus and to the ventral cochlear nucleus, a ganglion in close relationship to the restiform body. Fibers from the ventral cochlear nucleus pass to the periphery and terminate in the gray cortex of the superior convolution of the temporal lobe, supposedly in the middle of the first temporo-sphenoidal convolution. In this region, posterior to the perceptive center of hearing, is also situated the center for auditory images. The anterior part of this center, according to Alt, quoted by Escat, responds to high pitched tones, and the posterior to low pitched tones. Fibers from the lateral cochlear nucleus pass parallel to the fibers of the ventral cochlear nucleus and end in the corpora quadrigemina. According to Gowers⁴, certain fibers decussate about the nuclei and pass from each ear to the opposite hemisphere, thus a disease of these centers may produce a transient deafness in the opposite ear.

The vestibular branch, the nerve of equilibration, passes into the superior vermis of the cerebellum, ending in the nuclei of Deiters, and, according to Cunningham, also in certain sensory nuclei of other cranial nerves, as the lingual, vagus and glosso-pharyngeal.

The artery supply of the labyrinth has been very thoroughly described and illustrated by Siebenmann, Politzer and Shambaugh⁹. The labyrinthine artery, the single artery of the labyrinth, is a branch of the basilar artery and is a part of the central brain system, susceptible to the same pathologic changes as observed, for illustration, in the arteria centralis retinae. Branches are given off to the cochlea, vestibule and semicircular canals. Delicate convolutions of the arteries supply the scala tympani, the scala vestibuli and the cochlear spiral, as well as the macula acustica utriculi and saculi and the semicircular canals, and are thus in minute relation to the auditory nerve and its entire subdivision, the convolutions of the veins and their convergence into one large vein, the vena canaliculi cochlearis, resembling thus, the artery.

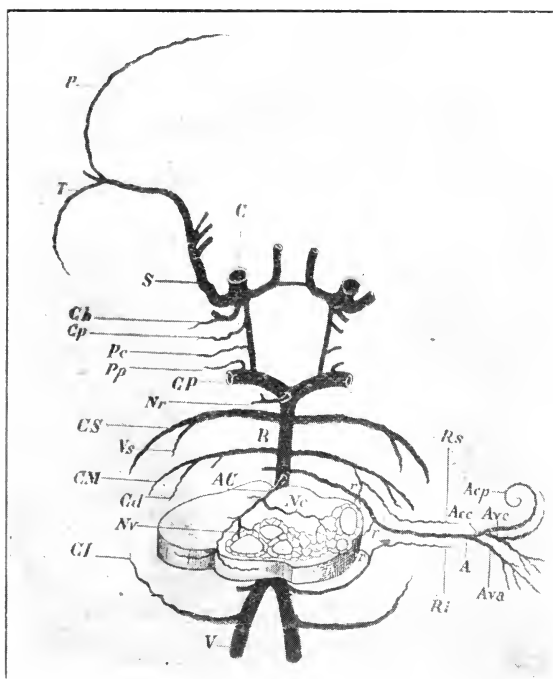


Fig. I.

P—Branch of the sylvian artery supplying the ascending parietal convolution, in which is the center of conscious equilibration.

T—Temporal branch of the sylvian artery, which is the nutritive artery of the temporo-sphenoidal convolution, the center of auditory perception and auditory images.

Ch—Branch of the communicating posterior.

Cp—Anterior choroid.

(Both Ch and Cp traverse the posterior arm of the internal capsule, through which pass the acoustic tracts.)

Pc—Branch of the posterior communicating.

Pp—Branch of the posterior cerebral.

(Both Pc and Pp supply the cerebral peduncle, by which pass the bulbo-cerebello-cerebral labyrinthine tracts.)

Nr—The central artery, of which a collateral branch furnishes a terminal artery to the red nucleus, which is a relay of the cerebello-cortical paths.

CS—The superior cerebellar artery.

CM—The middle cerebellar artery.

CI—The inferior cerebellar artery.

Vs—Branch of the superior cerebellar artery, which is the principal supply to the superior vermis, in which is the center of reflex equilibration.

Cd—Branch of the middle cerebellar artery, which supplies the dentated body, in which is the center of reflex equilibration.

AC—Central artery of the medullar group, supplying the principal medullar centers of hearing.

Nc—Branch to the cochlear nuclei.

Nv—Branch to the vestibular nuclei.

Rs—The superior radical artery of the auditory and facial nerves. (The nutritive artery of the auditory trunk.)

Ri—Radical auditory artery. (Nutritive of the auditory trunk.)

rrr—Bulbar branches of the radical artery and the internal auditory.

A—The internal auditory artery (nutritive artery of the labyrinth).

Acc—The common cochlear artery (of Siebenmann).

Ava—Interior vestibular artery (nutritive artery of the vestibule).

Avc—Vestibulo-cochlear artery (nutrient artery of the inferior spiral of the cochlear and of the vestibule).

Acp—The proper cochlear artery (nutritive of the two superior spirals of the cochlea).

According to the investigations of Shambaugh, no blood vessels were found by him in the organ of Corti. Blood vessels appear, however, in the connective tissue supporting the membrana basilaris. The basilar membrane is supposed by Boenninghaus to vibrate by molecular movements communicated to the labyrinth waters by the stapes, and its function is probably controlled by the increased or diminished blood supply to the supporting connective tissue.

Escat has given us a careful description of the cerebral blood supply and its intimate relation and influence upon the aural centers and the labyrinthine terminal nerve fibers. A close study of Figure 1 will show the possibility of functional and organic change in the different centers from circulatory disturbances.

The classical causes of arteriosclerosis are syphilis, laborious occupation, alcoholism, lead poisoning, infectious fevers, autointoxication, vaso-motor disease from central disturbances, heredity and lack of balance of ductless gland secretion.

It is unnecessary for the elucidation of the subject for me to do other than refer to the subject of interstitial myocarditis and valvular insufficiency as sequential or secondary to arteriosclerosis, other than to express the theory accepted by most writers, that fibrous myocarditis is but one of the expressions of a general or local arteriosclerosis.

Heredity is recognized as an important factor in the etiology of arteriosclerosis. The same rule may be applied to arterial change as to hereditary influence in catarrhal deafness as referred to first by Von Troeltsch, and to otosclerosis by Siebenmann, Dencker, Bezold and Koerner.

Arteriosclerosis may be local or general in character and thus a sclerotic change in the arteries may be limited to the ear alone, and be unilateral or bilateral in character.

In the writer's experience, syphilis is a very frequent cause of labyrinthine deafness. We are sometimes prone to believe that sudden loss of hearing, especially with partial loss of bone conduction, is due to some condition resembling Meniere's disease, rather than to disease of the labyrinthine artery. Syphilis more often brings about a primary change in the vessel walls, and the change may be endarteritis obliterans, arteritis, and fibrous degeneration of the wall. The fibrous deposits in the walls of the arteries were regarded by Thoma as nature's method of repair following degeneration of the muscular tissue of the artery. In deafness from syphilis, we also frequently find present a beginning general arteriosclerosis and mild interstitial myocarditis. The deafness may be entirely confined to one side. In general arteriosclerosis from age, deafness is usually bilateral. Typhoid fever and many infectious diseases are followed by circulatory disturbances, sometimes for many months, and if the patient is not carefully guarded against these conditions which might retard repair, local or general change in the arteries and veins may occur, very obscure at first, and very insidious.

Pearce and Stanton⁶ (*Journal of Experimental Medicine*, 1906), demonstrated on rabbits that a sclerotic area in the aorta and aneurismal bulgings, due to degenerative changes and calcareous deposits in the muscular fibers of the media, resulted from the injection of 1 to 1-1000 solution of adrenalin every other day. If these results hold good in man, it stands to reason that the promiscuous and continued use of adrenalin in nasal irritations, and the continued use of the drug hypodermatically for the relief of asthmatic conditions, should be discouraged somewhat until our knowledge of the subject has been more thoroughly defined.

The pathology of general arteriosclerosis is well understood and a brief reference to the changes observed may be all that is necessary. The affection probably begins as a structural change in the vasa vasorum, and is fibrous in character. In consequence of this, the nourishment of the artery wall is disturbed and connective tissue degeneration takes place in the media. Fatty degeneration soon follows in the intima with the formation of deposits of calcareous salts. The vessel wall is narrowed and sometimes obliterated.

The pathologic change noted in the labyrinth is of more special interest. The same general rule of change takes place in the labyrinthine artery and its branches as in the larger arteries. The terminal arteries in the labyrinth are so small that any structural change is quickly manifest in the nerve structures. As soon as the nutrition of the basilar membrane and organ of Corti is partially or completely cut off, there is an atrophy of the sensory auditory cells and connective tissue proliferation of all the structures. The same change may be

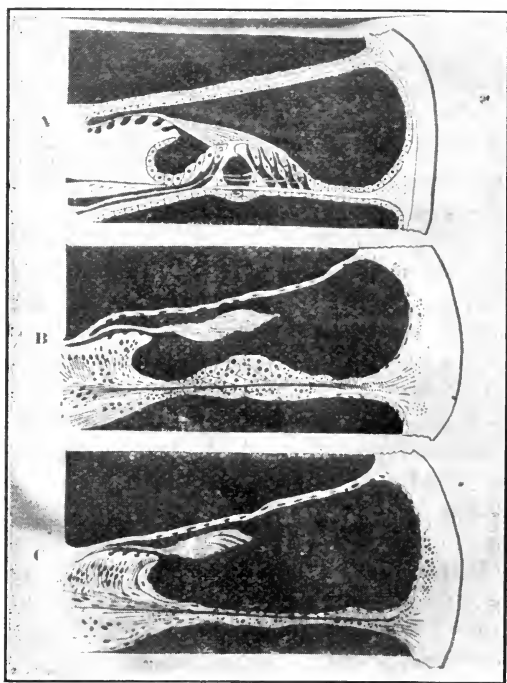


Fig. II.

Schematic Drawing, Showing the Normal Organ of Corti in Comparison with the Organ of Corti in Arteriosclerosis.
(After Alexander and Escat.)

observed in the nerve endings of the vestibulae and semicircular canals.

A study of the schematic drawings in Figure II, taken from Alexander and Escat, will give the reader a clear conception of the change in the cochlea. Figure A represents the normal organ of Corti. In Figure B, there is shown a complete atro-

phy of the cells of Claudius and Deiter, and the epithelial cells of Reissner's membrane.

The cells of the organ of Corti have undergone connective tissue proliferation, with closure of the tunnel of Corti and disappearance of the *vas spirale*. In Figure C, there is represented the last stage of the destructive process as described by Alexander, that is, absorption of the nerve elements and connective tissue deposits.

The change in the brain structures from arteriosclerosis may vary according to the amount of nutrition carried to the parts. In endarteritis obliterans in the vessels to the center of hearing and equilibration, there is, on account of the slow change in the artery wall, degeneration and atrophy of the brain cells. The same morphologic change takes place when the blood supply is partially destroyed. In hemorrhage extravasation from rupture of the atheromatous blood vessels, there is death of the cells. Thus alteration in the center for audition and conscious equilibration, or equilibration, must vary according to the blood supply and inherent vitality of the cells.

The general symptoms of arteriosclerosis are increased arterial tension, increased tortuosity and prominence of the arteries of the temple, hypertrophy of the heart, and if the last is present, there is generally a lowered vitality of the individual, a sensation of age, and tiring, as from overwork, followed by an appearance of premature aging. In interstitial myocarditis, associated with sclerosis of the coronaries, the pulse may be extremely weak and irregular, and the apex beat of the heart very strong; in other cases, the pulse may be full and the heart beat loud and displaced to the left. According to Osler, in addition, "The combination of heightened blood pressure, a palpable thickening of the arteries, hypertrophy of the left ventricle and accentuation of the aortic heart sound, are signs pathognomonic of arteriosclerosis."

Analysis of the urine usually shows increase of the urates and long, thin, hyalin casts, undergoing granular degeneration. Other kidney changes will become manifest in arteriosclerosis of the kidney, as albumin, uric acid and calcium oxalate crystals. Many other symptoms could be enumerated. For further information, the reader is referred to the contributions by Stengel⁸ on the subject of myocardial disease.

The ear symptoms which should direct our attention to a local or general circulatory disturbance, are unilateral or bi-

lateral tinnitus, slight and progressive deafness, loss of air and bone conduction, dizziness sometimes early in the disease and in the later stages of the disease, sometimes hallucinations of hearing. The ear symptoms necessarily vary according to the extent of the sclerosis. It is well known that in severe hemorrhage or progressive anemia, deafness and tinnitus may occur. If the hemorrhage and anemia are severe and prolonged, deafness may be permanent, being due to an obliteration of some of the blood vessels of the cochlea or the special cochlea center in the brain. A passive tinnitus or a passive dizziness is probably due to a circulatory disturbance in the arteries of the semicircular canal or special centers of equilibration. These conditions are frequently attributed to liver disorder, rather than a valuable symptom of a possibly beginning general arteriosclerosis. A deafness without dizziness, tinnitus, or Meniere's syndromes (providing no mechanical cause of deafness exists), with some general symptoms of arteriosclerosis, is indicative of thickening in vessels to the nucleus, and if associated with peripheral paralysis, may be indicative of disease of the internal capsule. Loss of hearing with dizziness may be due to a vascular disorder from tumors in the cerebrum, cerebellum or pons varolli, as well as to a sclerosis of the labyrinthine artery. Loss of hearing and dizziness, continuing for a long time, are valuable signs of vascular disturbance in the entire encephalon. If the eye symptoms are also present, the evidence is complete.

A beginning sclerosis of the vertebral artery may press upon and irritate the cervical sympathetic fibers which send fibers to the labyrinth, supposedly through the non-medullated cells of Remak, found by Erlitzki in the auditory nerve (Bonnier), probably producing a tinnitus or dizziness long before the sclerosis has extended to the arteries of the labyrinth.

Escat calls attention to the sympathetic system and its influence, especially in the production of the serous effusion in Meniere's disease, which may take place in the labyrinth, from a sudden irritation in the vaso-dilator fibers or paralysis of the vaso-constrictors. It must be conceded that any molecular change in the blood vessel wall, as described by Cohnheim, from intrinsic or extrinsic causes, predisposes to Meniere's disease.

The diagnosis of local or general arteriosclerosis depends upon the symptoms enumerated above. The essential point to be accentuated in this paper, is the early symptoms of arterio-

sclerosis as manifested in the ear, that is, tinnitus, vertigo, nutritive change in the membrana tympani, and the necessity for a careful general examination of such cases. The diagnosis of faulty nerve perception, with the modern tuning fork, is easy. The location of the lesion in the nuclear or peripheral endings of the nerve, is somewhat difficult, however, Gradenigo⁵ has quite well established the theory that there is diminution in the bone conduction for highest tones in peripheral nerve deafness, whereas in central deafness, there is not as pronounced loss of perception for high tones as for low ones. In both central and peripheral deafness of slight or pronounced degree, it is reasonable to presume a corresponding loss of bone conduction for all tones. Before making the above differential test, it is necessary to exclude any disease of the conducting apparatus. In disease of the conducting apparatus and nerve deafness, the test for central deafness is difficult.

In a late case of aphasia under observation, there was a diminution in low tones on the left side, as well as high tones, a further proof of the theory of Gradenigo.

The disease shou'd not be confounded with Meniere's disease, which is a condition sudden in its onset, though probably often due to primary arteriosclerosis, hyperemia of the auditory nerve from ingestion of certain drugs, hysterical deafness, or nerve deafness from toxic absorption, as is sometimes observed in parotiditis, or hemorrhagic extravasation into the labyrinth, from a fall or blow upon the head.

For want of time and space, the middle ear symptoms will not be considered, other than to call attention to the diagnostic value of the presence of the arcus senilis of the tympanic membrane, present in so many cases of general arteriosclerosis.

In a general sense, the prognosis depends upon the extent of the sclerosis, that is, whether or not it is general or local in character, and the degree of arterial change.

If habit, occupation or disease affecting the trophic and vaso-motor systems can be controlled etiologically before the disease is far advanced, the prognosis may be favorable. Those cases due to syphilis which are discovered early, before degeneration has taken place in the blood vessels and nerve of audition, in which the disease is purely functional rather than organic, the prognosis under treatment is favorable.

When the cells of the basilar membrane or of the organ of Corti are once destroyed, they cannot be restored. It is unfortunately impossible to prognosticate this condition for the reason that heretofore too little attention has been given to the affection by the otologist. These cases have drifted to the general medicine man, who has more often ignored the ear symptoms and given them no recognition in the diagnosis of general disorders.

I believe it is just as essential for the neurologist to study aural symptoms as eye symptoms in brain disease. The ear is as much an off-shoot of the encephalon as the eye.

There are also certain aural symptoms when taken separately or collectively, that may enable us to tell, satisfactorily, something of the cure or relief of the deafness, dizziness or tinnitus. As to the value of many of the symptoms in prognosis, I am indebted to the illuminating remarks of Escat.

If tests of hearing show slight nerve or central deafness rather than labyrinthine deafness, the prognosis is more favorable. Involvement of the centers of equilibration may respond to treatment. Prognosis in Meniere's syndromes, due to arterial change, is dependent upon the amount of destruction in the artery to the semicircular canal, and if slight, prognosis is favorable, whereas if severe, the prognosis is unfavorable.

Persistent dizziness, with slow pulse, respiratory disturbances and paralysis, is a grave symptom. The prognosis is unfavorable in continued deafness with Meniere's syndromes. When vertigo and deafness are transient and variable in character, the lesion is probably in the center of equilibration, and the prognosis is favorable.

With the establishment of complete labyrinthine deafness, accompanying tinnitus may suddenly disappear. A lesion in the center of equilibration, due to arterial change or arteritis obliterans, may possibly be relieved in time by compensatory circulation.

That the syndrome is intimately associated with change in the walls of the central blood vessels is emphasized by the frequency with which these symptoms precede hemorrhage into the internal capsule and their frequency in the chronic form of meningitis, so that when associated with increase of blood pressure, tinnitus, vertigo and impairment of hearing have become recognized as of extreme importance in the foreshadowing of the graver intracranial disaster.

The treatment of arteriosclerosis of the ear is both general and local, depending somewhat upon the exciting cause. Those cases with hereditary influences as predisposing factors, do not respond to treatment as do those with syphilis or acquired causes. However, in both conditions, the iodid of potassium, in from two to five grains, four or five times daily for long periods of time, is indicated.

H. Richardson⁷ recommends glycocholate of sodium, in five grain doses, in arteriosclerosis from any cause.

Where the heart is able to withstand the shock, hot baths are indicated. Too much exercise is contraindicated in any stage of the disease, and rest is more essential than exercise.

The diet should be carefully regulated. The patient should consume only a moderate amount of meat, no alcoholic liquors, and very little tea, coffee, or tobacco. A moderate amount of water should be taken, the excessive use of water being discouraged.

The question of the effort to control the high blood pressure, observed in some cases, due to the presence of toxins, must be governed by the etiology in each separate case. In the nephritic cases, high pressure is supposed to be beneficial whereas in cases of angina pectoris, apoplectic or Meniere's syndromes, those drugs considered vaso-dilator may be beneficial.

The local treatment consists in inflation of the middle ear twice or three times weekly, through the Eustachian catheter with superheated air, for the stimulating effect of the air, and external massage. If there is a suspected sclerosis of the blood vessels of the Eustachian tube and middle ear, the treatment differs but little from that for dry catarrh.

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XXVII.

HYPERTROPHY OF THE PHARYNGEAL LYMPHATIC RING AS A CAUSATIVE FACTOR IN THE PRODUCTION OF EPILEPTIC EQUIVALENTS.

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As far back as history shows and tradition indicates, epilepsy has afflicted man. Methods without number, drugs beyond estimate, have been employed for its cure. Yet epilepsy is ever with us, and still no specific has so far been found. In view of this fact, the great importance of preventing epilepsy becomes apparent, and to prevent it in one group of persons we must be able to recognize a tendency before it eventuates in a habit, and in another realize the enormous importance of certain peripheral irritations as a cause.

A child of neurotic heredity is especially prone to motor nerve storms, and the first indication of an epileptic tendency is often an attack of infantile convulsions. It is not assumed that such an outbreak invariably precedes epilepsy, but it is unquestionably the fact that a large majority of epileptics of whom an accurate history is obtainable, have had these convulsions in infancy.

Furthermore, epilepsy, from the viewpoint of modern neurology, is not necessarily characterized by convulsions, for, it is an indisputable fact that an attack of epilepsy may occur without a convulsive seizure, the convulsion being substituted by certain mental disturbances called epileptic equivalents.

Such attacks in childhood exhibit a morbid sensibility to peripheral irritations, and should be esteemed a peremptory indication for years of watchful care, our aim being to prevent the occurrence of other convulsive seizures and the formation of a habit of convulsion or epilepsy.

An epileptic equivalent, therefore, is a certain state of consciousness differing not only from normal consciousness, but from the state of consciousness that usually occurs in epileptic attacks. The term really signifies a psychical state that in some degree takes the place of an epileptic seizure.

These phenomena present many points of interest, are of rarer occurrence than true epilepsy and are more difficult to diagnose.

Case:

Harry P., aged 10, was a farmer lad, whose family history was negative, and whose relatives on both sides were long lived and healthy.

Personal History.—Patient developed naturally as a baby, but at the age of two years had what was called a “worm fit,” which came on quite suddenly with nausea and vomiting, followed by an attack of what was undoubtedly a seizure of the grand mal type of epilepsy, presenting the classical symptoms, general tonic and clonic spasms, cyanosis and loss of consciousness.

Following the attack, which lasted five minutes, the patient urinated very freely. During the next three years the child averaged about three of these attacks a year; the attacks, however, gradually increased in severity and duration. At the age of five the attacks suddenly ceased, to be followed by a period of quiescence, lasting five years, during which, the boy, to all appearances, acted like other boys, was very quick to learn, and showed no abnormal traits.

Suddenly, during the night of February 18, 1906, the patient was taken with a spell, during which he complained of being afraid, wanted to leave the house, cried out spasmodically, putting his hand to the right side of his head, as if his ear, on that side, were aching. When the pain was at its height, the boy appeared dazed and aimlessly moved about the house. This spell of insane manifestations lasted nine days, then gradually subsided, and for a period of two weeks the boy was, apparently, as well as ever.

He then had a second attack which came on suddenly while in the barn helping his father remove a calf from one stall to another. The first thing noticed was that he began asking his father where his calf was; he apparently did not comprehend his surroundings and had forgotten what he had been doing just a few minutes before. With expression vacant, and ideas confused, he wandered from one person to another, finding nothing to please him, nothing to pacify him.

Shortly afterwards, he complained of pain, now in the left side of his head, and frequently cried out: “Oh, my ear.” This condition lasted for a period of seven days and then ended

abruptly, when the patient cried out: "There, it has gone." After three or four days of sluggish mentality, he gradually brightened up and appeared well for about two weeks, at which time he was visiting his aunt, who noticed, about the noon hour, that he began to talk strangely, to sing, and to fear being left alone. At two o'clock he complained of severe pain in both sides of the head accompanied by the usual insane manifestations of the previous attacks.

The attack lasted nine days, gradually subsiding in three or four days, to be followed by a fourth attack two weeks later.

The fourth attack suddenly began about nine o'clock in the morning, when the boy rushed out into the road and, looking up the hill nearby, began calling: "Hello, Frank," and shook his hand over his head. There was no one in sight—evidently hallucinations of vision. In a few hours pain in the head supervened, and he appeared dazed and confused. He did not seem to recognize the presence of his parents, even though they were by his side; would frequently call his mother, even while she was trying to quiet him. Evidently illusions of identity.

During all these attacks, there was entire oblivion on the part of the patient of all that had happened.

It was during this last attack, and on account of some possible mastoid implication, that the writer first saw the case with Dr. George Young, of Prescott, Ontario, the family physician, to whom I am indebted for much of the early history. On my arrival at the house, the boy, crazed and delirious, ran away, and it was with difficulty that he was apprehended. A thorough examination was impossible; so, the parents were advised to bring the boy to my office when a lucid interval would occur, which I had every reason to believe would come in about ten days.

About two weeks afterwards, on June second, he was given a thorough examination with the following findings: The patient is a well developed boy of ten years, light complexion, light hair, lips slightly thickened and gaping, mouth breather, with a lack of resonance of the voice, obliteration of the normal lines of expressions of the face, pupils moderately and equally dilated, the special senses normal and unimpaired, nothing abnormal about the ears or mastoids, a coarse tremor of the tongue and fingers, the other parts of the body being steady. The patient has control of the various muscles of the body, showing good strength; nothing abnormal was

found in the chest and urinary organs; temperature and pulse normal, the roof of mouth is narrow and highly arched. Examination of the throat showed marked hypertrophy of the pharyngeal lymphatic ring. Finding nothing, beyond an hypertrophy of the tonsillar ring, to account in a causative way for the several attacks of which the boy had been the victim during the past four months, I called in consultation, Dr. R. H. Hutchings, Psychiatrist and Superintendent of St. Lawrence State Hospital at Ogdensburg, N. Y., who, after careful inquiry, diagnosed the attacks as epileptic equivalents. It was brought out that these epileptic manifestations, in a boy epileptically inclined, might be produced by some peripheral irritation, such as, in this case, hypertrophy of the pharyngeal lymphatic ring.

So, accordingly, on June fourth, I removed the hypertrophied condition of the tonsillar ring, with the result that all the epileptic manifestations have disappeared and have remained so to the present day.

In view of the striking results here obtained, it must be concluded that this case of epileptic equivalent was either wholly or largely due to the irritation in connection with the hypertrophied tonsillar ring. As would be expected, his mental condition has also improved very much since the removal of this peripheral irritation.

The case, from early childhood, was evidently one of epilepsy, the manifestations of which were caused by some peripheral irritation, which, if removed, would, in all probability, safeguard the child against future and more serious attacks.

Any irritation, whether it be in the alimentary canal, worms, carious teeth, stomach affections; in the respiratory organs, polypi, adenoids, tonsillar hypertrophies; or in the eye, ear or sexual organs may precipitate an explosion in a patient epileptically inclined. It is probable that the peripheral irritation in some way interferes with or disturbs the circulation of blood through the brain. There seems to be first a spasm of the cerebral arteries, causing a profound anemia of the brain, and later a dilatation of the cerebral vessels causing a congestion or hyperemia of the brain.

Up to within a few years, because the symptom-complex of certain types of minor epilepsy occurring in early childhood did not bring out prominently those classic symptoms of epilepsy, tonic or clonic convulsions with loss of consciousness,

the medical profession has passed them by, entirely overlooking and ignoring their importance and gravity. Allow incipient manifestations such as "worm-fits," "teething fits," "stomach fits," "lapses," "faints," "night horrors," "sleep walking," "absentmindedness," and other apparently innocent phenomena, which are nothing more than epileptic equivalents, to pass unnoticed and uncared for, and you may have, thoughtlessly, launched your little patient upon the full tide of epilepsy.

If there is one disease in which early recognition is desirable, it is epilepsy. The early recognition of these obscure epileptic manifestations of early life, which present themselves under so many and so diverse forms, is really a difficult problem. For unless we are constantly on the lookout for them, we are very apt to view them rather as the innocent mannerisms of childhood life than the true landmarks of a disease so full of torment for the body and so disastrous to the mind.

Epileptic equivalents in childhood commence so insidiously that they are hardly noticed at first. Look at the little child of two or three years drumming away on its plate at meal time, and, all of a sudden, stops, strikes some peculiar dazed attitude for a short time and then resumes its play with a smile. At first the parents regard these spells as cute, but when the child reaches the age of five or six, they think it is high time for the child to discard its baby cuteness; so, in the effort to correct these hitherto cute, but now, annoying ways, the parents resort to all kind of discipline and even punishment.

The convulsion tendency of a child in whose life we find such mother-named spells as "worm-fits," "teething fits," "stomach fits," "faints," "lapses," or any other convulsive manifestations of similar nature, should be a matter of solicitude to the attending physician as long as that child lives. It should be an invariable rule to search thoroughly every such individual for points of irritation. Wounds of the head or other parts of the body, astigmatism and other imperfections of the eyes, diseases or malformations of the throat and nasal cavity, carious teeth and retained milk teeth, aural disease, adherent prepuce or other irritation of the genital organs are among the irritations which have in very many cases provoked epileptic manifestations.

The importance of thorough examination is increased by the fact that the reflex epilepsy may engender the epileptic habit.

Even with the passing of infancy there still remain certain critical periods such as the first and second dentition and at puberty, during which that same convulsive tendency of former days must be guarded against. Epilepsy, in its development, occurs with greatest frequency between the ages of ten and sixteen.

"The keynote to the whole situation," as Sprattling says in his article on "Unrecognized Epilepsy," "is in mistaking apparently innocent phenomena for phenomena of the gravest import. Muscular contractions and distortions are nothing in the prognosis of epilepsy compared to the disastrous form of the disease that may be so silent in its appearance, course and termination as wholly to escape unskilled observation. We are just beginning to learn a great truth in the treatment of epilepsy, similar to the one it took us hundreds of years to learn about tuberculosis, and that is, that freedom from the disease is often but little more than a matter of right living."

It is not my intention to convey the impression that this young boy was cured of his epileptic manifestations, by the simple removal of his hypertrophied tonsillar ring, rather, that another blow at the mentality of this epileptically inclined boy was warded off. For, as it has been well said: "The convulsive tendency of an individual must be respected so long as that individual lives." But I do make a plea for the early recognition and proper treatment of epileptic equivalents, of whatever nature, as they occur in the practices of the fellows of this society, so that hand in hand with the neurologists of today, no obscure nervous disease due to a peripheral irritation whether it be in the eye, ear, nose or throat, may be allowed to pass unrecognized and uncared for.

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XXVIII.

EPITHELIOMA OF THE LARYNX; TOTAL LARYNGECTOMY INCLUDING THE REMOVAL OF PART OF THE TRACHEA. DEATH FROM PNEUMONIA ON THE THIRTEENTH DAY*.

BY CLEMENT F. THEISEN, M. D.,

ALBANY, N. Y.

This case is reported, because it emphasizes the point brought out by Delavan in a paper read at a meeting of this Association (Recent Advances in the Treatment of Malignant Disease of the Larynx. 1904), that *early* radical operation offers the only reliable prospect of cure in cancer of the larynx. It brings out another point, so often raised by Mackenzie in discussions upon this subject, that microscopic diagnosis of cancer of the larynx is often difficult, and that the laryngologist may be misled by his pathologist, and valuable time lost.

There is no doubt, however, that the fault is often the laryngologist's, because he does not cut deeply enough into the growth when he removes a piece for microscopic diagnosis. It is well known that a laryngeal growth may not show malignancy on the surface, and still be malignant. This question has been so thoroughly discussed at meetings of this association that I will not go into it any further. I will say, however, that in my own case, it would have been better, and the patient would have had a better chance, if the radical operation had been performed just as soon as the naked eye diagnosis of cancer was made.

I *did* make that diagnosis, but after several pieces had been removed for microscopic examination, and the report had come back that the growth was not malignant, I felt doubtful of my diagnosis, and so lost much valuable time.

I have no doubt that the removal of pieces of the growth for examination was probably responsible for the very rapid extension of the disease subsequently.

*Read at the Twenty-ninth Annual Congress of the American Laryngological Association, Washington, May, 1907.

Mr. F. M., aged 57 years, was referred to me by his physician (Dr. Barnes, of Troy), with the history, that for several months he had been hoarse, but that his general condition had been very good. I first saw him last September. On examination, the nose, nasopharynx, and pharynx, showed practically normal conditions. On laryngeal examination, however, a rather flat, somewhat nodular, firm growth, involving about two-thirds of the left vocal cord, was seen. This presented, very much, the appearance of multiple, small, papillomatous excrescences. The left ventricular band was somewhat reddened and thickened, as was also the mucous membrane in the left arytenoid region. The right cord was slightly reddened, but was smooth and otherwise normal.

On October third, several small pieces of the growth were removed with cutting forceps, and sent to the laboratory for microscopic examination.

The report came back that the growth was not malignant, and was probably of an inflammatory character. My original clinical diagnosis was carcinoma, but thinking that I must be mistaken, I talked the matter over with his physician, and we decided to use palliative measures for a time. There was no involvement of the cervical lymph nodes so far as could be determined.

The patient was under my observation for a number of weeks after this, and improved somewhat. Then I did not see him until January 14th of this year. He had been having considerable dyspnea, and was breathing with some difficulty when he came into my office. The growth had extended very much in the interval, involving the whole left cord, extending below the cords, and the right cord also showed evidence of a new growth. The condition now was so clearly malignant, and the dyspnea was so great, that I performed tracheotomy, using equal parts of a sterile solution of 1 per cent cocain and 1-10,000 adrenalin.

This solution I have used in a number of tracheotomies in adults, and it has given uniformly good satisfaction.

I told him that a radical operation still offered him some chance, but it was not until three weeks after the preliminary tracheotomy that he would consent to this. A total laryngectomy was performed in the Samaritan Hospital in Troy, and for a week the patient got on very well.

The method that has been advocated by Gluck, working from above downward, was followed. Because the growth

had extended into the upper part of the trachea, the trachea was removed with the larynx for some distance below the site of the preliminary tracheotomy, the severed trachea being stitched to the skin. Chloroform was administered through the tracheotomy tube during the operation.

The patient was given no nourishment by the mouth for several days after the operation, and for a week got along very well. He then developed a pneumonia and died on the thirteenth day after the operation.

The operation was performed in conjunction with Dr. Harvie, of Troy, attending surgeon to the hospital, and Dr. Barnes.

The pathologic report is as follows:

SAMARITAN HOSPITAL,

February 9, 1907.

Gross Description: The specimen consists of a larynx. On its anterior surface, just below the thyroid cartilage, a small portion of skin is attached, in the center of which is a sinus communicating with the trachea below the larynx, the result of a tracheotomy. The walls of the sinus are lined with granulation tissue. The inner opening into the trachea is about 1 cm. in diameter, and much larger than the surface opening. By looking into the larynx from above, a vegetative growth is found on the vocal cords, particularly on the left side, and the cords seem partially fixed. After sectioning the larynx posteriorly in the median line, the left side is found to be almost completely covered with a whitish, minutely nodular, fungoid growth, of firm consistency. The growth extends to the right side also, but involves only the anterior third of the right vocal cord. The central portion of the growth is softened, and somewhat degenerated, the advancing edges elevated and hard. No regional metastases are found.

Anatomic Diagnosis: Epithelioma of the larynx.

Microscopic Appearance: The surface epithelium, at the margin of the growth is of normal appearance, its transition into the malignant growth can be definitely demonstrated in the sections. The growth itself is entirely of epithelial origin, and consists of irregular columns or spheres of epithelial cells, growing into the underlying tissue in all directions. The cells are cuboidal or round, of large size, with a pale staining nucleus, and many mitotic figures can be seen. The marginal cells are more closely packed, and resemble in their arrange-

ment the stratum Malpighii in the epidermis. The growth shows a tendency to rapid degeneration in the centres of the columns and spheres, for frequently the cells are replaced by granular detritus. The interstitial connective tissue is thickly infiltrated with small mononuclear leucocytes and plasma cells, and in some areas there is a proliferation of the small capillaries. The hyperplasia of the connective tissue is definite, and has the appearance, in places, of granulation tissue. No metastases could be found.

Revised diagnosis: Epithelioma of the larynx.

H. W. CAREY.

Undoubtedly, Gluck has had by far the largest experience in total laryngectomy for malignant diseases of the larynx, and has had the most successful record, considering the large number of operations he has performed.

Recently, Chevalier Jackson (*British Med. Journal*, November 24, 1906), reported eight total laryngectomies, with no operative mortality. One of the patients lived seven years after the operation, and one case lived three years without recurrence, dying of cerebral hemorrhage. One patient lived eight months, dying of alcoholism. Of the remaining five, three recurred within a year, one apparent cure was lost sight of, and one was too recent to record.

Preliminary tracheotomy seems to be advisable, although Keen, without preliminary tracheotomy, severs the trachea and stitches it to the skin as the first step, after exposing the larynx and trachea. This method of stitching the trachea to the skin was also successfully employed by Solis-Cohen in his well known case.

In conclusion, the writer would say that in his case the delay occasioned by the favorable report of the pathologist was certainly injurious to the patient. An early thyrotomy might have been performed, with a much better chance for the patient. In such doubtful cases, it would seem best to depend upon the naked eye diagnosis of cancer and go ahead with the operation immediately.

The removal of pieces of the growth for microscopical examination, is not always wise, because if only small pieces are removed from the surface of the growth, the examination may not show malignancy.

XXIX.

SARCOMA OF THE PHARYNX IN A CHILD OF EIGHT YEARS, WITH AUTOPSY FINDINGS AND MICROSCOPIC REPORT*.

BY CLEMENT F. THEISEN,

ALBANY, N. Y.

A search of the literature of the past twelve years revealed the fact that sarcoma of the pharynx in young children is rare, so that the writer considered the following case worth placing on record.

A. S., a girl aged eight years, was referred to the writer on January 11th of this year, with the history that for several months there had been an increasing difficulty in breathing. The child's parents are living and well, and there are five other perfectly healthy children in the family. The child's great-grandfather is said to have died of cancer of the throat. The child had lost weight rapidly and was in bad general condition.

Examination of the throat showed the presence of a large mass including the soft palate, and pushing it forward. The growth extended downward almost to the epiglottis, and, apparently, into the nasopharynx, although this could not be examined, as the finger could not be carried around and back of the growth. There was a constant discharge of an offensive mucopurulent material from the left nostril.

The mass was firm to the touch, and did not show any evidence of breaking down. There was some involvement of the glands, particularly of the left side of the neck.

Dr. Elting, of Albany, a general surgeon, saw the case with me, and agreed that the tumor was inoperable. The child was admitted to the Child's Hospital on January 14th, and it was decided to try mixed toxins (erysipelas and bacillus prodigiosus, Coley's serum), following the method advised by Coley (*Journal American Med. Ass.*, March, 1906). A piece of the growth was removed for microscopic examination, and sent to the Bender Laboratory, with negative results. Here again, although a fairly large piece was removed, we

*Read at the Twenty-ninth Annual Congress of the American Laryngological Association, Washington, May, 1907.

probably did not go deeply enough to show the malignant character of the growth. Clinically, however, there was no doubt at all about its malignant nature.

The injections of the serum directly into the mass were started a few days later. We started with m. 1/3 increasing m. j. or more each time. We got no reaction until January 25th, after the injection of m. iij. into the mass. Temperature rose to 103.4° F. Pulse 136. On the following day the temperature was down to 99° F.

There was another reaction (temperature 102° F., pulse 160), after the use of m. iv. of the serum. On February 3d. a hemorrhage from the nose and throat, lasting about an hour, occurred, and was controlled with adrenalin and ice.

The amount of the serum was steadily increased, and another reaction (temperature 102.6° F., pulse 140), obtained, when m. vij were injected. Reactions were also obtained when m. xiv and xvj were used. The injections were given at first every other day and finally every day, as much as m. xx being used.

The patient breathed with difficulty during the night of March 4th, and died on the morning of March 5th. Adrenalin injections were not used in this case, because the method is slow, and the child's condition was so bad that we thought prompter results would probably be obtained with the mixed toxins. Iodid of potash had been used without any result, and had to be stopped because it greatly increased the difficulty in breathing, by producing an edema of the mucous membrane.

For a few weeks after the serum injections were started, the child appeared to improve, the breathing being easier, and the growth apparently becoming a little smaller.

On the whole, however, in this case at any rate, the use of Coley's serum did not do any good. It certainly did not produce the slightest softening of the growth. The autopsy findings were as follows:

The Bender Hygienic Laboratory.

Name, Anna S.; No. 0-1108; date, March 6, 1907.

(Dr. Robinson).

Aged 8 years; Child's Hospital. Service of Dr. Theisen.

Clinical Diagnosis.—Sarcoma of soft palate.

Body is that of a fairly well-built, poorly nourished female child, measuring 123 cm. in length. Rigor mortis absent.

Pupils unequal, the right being dilated and measuring 5 mm. in diameter; the left contracted and measuring 1.5 mm. in diameter. A ptosis of the left upper eyelid is present. The cervical lymph nodes on both sides, but especially on the left, are enlarged and readily palpable.

On exposing the abdominal cavity, the intestines are seen to be distended with gas, the appendix is bent on itself and bound to neighboring tissue by firm fibrous tags. The mesenteric lymph nodes are apparently normal; pleural cavities, normal; pericardium, normal; heart, normal; lungs, normal; liver and gall bladder, normal; spleen, normal; stomach and intestines, normal; kidneys, normal; adrenals, normal; pelvic organs, normal; aorta, normal; neck, the left lateral aspect of the neck downward from the left ear is slightly prominent, and some enlarged lymph nodes are felt. The mouth is two-thirds filled, principally on the left side, with a firm, globular growth attached more at the left side of the junction of the soft with the hard palate, which extends from there to the side of the cheek down along the side and back of the pharynx on the left, and is most intimately adherent to the left side of the pharynx, especially to the pterygoid process and as far down as the gullet. The tongue fills the lower part of the oral cavity and the growth the upper part, both meeting tangentially as two spheroids, making it appear as if the communication with the pharyngeal opening was obliterated, but the obstruction is only apparent, and a finger can be readily introduced between the tongue and tumor into the pharynx.

By incision along the oral attachments of the tumor and by loosening up the pharyngeal attachments, the trachea, larynx, esophagus and tongue can all be removed with the growth.

The tumor consists of a pinkish white, roughened, irregularly lobulated mass of tissue measuring about 7x4x4.5 cm. It involves the entire soft palate, the pillars of the fauces on both sides, the left side of the pharynx, from the pharyngeal vault downward to a level with the epiglottis, the lower and right hand portion filling in the space above the epiglottis, but being free and unattached in this part, the attachments on the left side supporting the growth.

On section, the surface is homogeneous in appearance, with no coarse connective tissue stroma, but apparently very cellular. The tissue is glistening and semi-translucent, of uniform

consistency and of an elastic nature. On a level with the upper margin of the thyroid cartilage and to the front of the lateral border of the mass above described is a smaller, but similar mass measuring $3 \times 2.5 \times 2.2$ cm., probably a group of enlarged cervical lymph nodes.

Anatomic Diagnosis.—Sarcoma of the pharynx. Enlargement of cervical lymph nodes. Chronic periappendicitis.

Microscopic Description.—Sections through the tumor show tissue which, in most parts, is densely cellular. The cells have deeply staining, somewhat vesicular, oval or spindle shaped nuclei, with little or no intracellular substance. In places the cells are arranged in fascicles, which cross and interlace and here the structure is less dense than elsewhere. Connective tissue trabeculae penetrate in various portions, and edema of some areas is present. Blood vessels are abundant and fairly well formed. The enlarged lymph nodes in connection with the tumor do not show an invasion by the growth. A marked hyperplasia of the lymph follicles and lymphoid element exists.

Microscopic Diagnosis.—Spindle celled sarcoma with hyperplasia of neighboring lymph nodes.

J. O. ROBINSON.

The following case, reported by Halstead (Trans. Amer. Laryngol. Rhinol. and Otol. Soc., 1897), was somewhat similar to the writer's.

Emma R., aged two years, was brought to consult him on May 6, 1896. The child's respiration was labored, noisy and rapid, skin of the face of a milky pallor, with marked cyanosis, and the child was only partially conscious of its surroundings.

On examination, the right side of the nose was seen to be occluded by a growth projecting externally. Left nostril was also occluded. The soft palate was pushed forward by a mass presenting itself in the oropharynx. There was no ulceration. The child's dyspnea was so great that Halstead performed tracheotomy almost immediately. Twenty-four hours later there was a hemorrhage through the tube. The child took no nourishment and died two days after the operation. A histological examination of the specimen obtained at autopsy showed it to be a sarcoma.

McIlvill Black (*Colorado Medical Journal*, April, 1901), has reported a case of papilloma of the soft palate, turning into sarcoma, in a child eleven years old. Two large tumors

of the soft palate were removed, which, microscopically, were reported to be papillomata. There was a recurrence four weeks after the operation, and an examination then showed the tumor to be a round-celled sarcoma. Child died.

Another case of round-celled sarcoma of the pharynx has been reported by Hanszel (Ber. d. Wiener laryngol. Gesellsch. January 9, 1902), in a child three years old. The author states that it developed as a phlegmonous angina.

Schmidt has reported a case of sarcoma of the soft palate in a boy twelve years old. A radical operation was performed, but the final result is not given. (Adolf Schmidt. Alveolar-sarcom des weichen Gaumes. (*Münch. med. Wochenschr.* No. 10, 1904.)

A case of fibro-sarcoma of the nasopharynx has been reported by Mermet (Soc. Anat. Paris, July 14, 1894). A tumor as large as an egg, probably originating in the inferior turbinate, posteriorly, hung down into the pharynx. It occurred in a girl 16 years old.

Another case in a girl of the same age was observed by Simpson (Tr. Amer. Laryngol. Ass., 1893). This was a sarcoma of the soft palate, and another example of the degeneration of a benign into a malignant growth. The soft palate was removed. Death resulted eight months after the operation, and over two years after the development of an apparently benign growth.

To consider briefly now the result of the treatment of sarcoma of the pharynx in children, the outlook, judging by the reported cases, is not very promising.

W. B. Johnson, however (*N. Y. Med. Record*, 1894), has reported a case of sarcoma of the palate successfully treated with the toxins of erysipelas. The patient, a girl, 16 years of age, had a sarcoma involving the soft palate, posterior wall of the pharynx and epiglottis. The mixed toxins were used, and after nine months' treatment, great improvement resulted. The growth "nearly" disappeared.

Hanzel (*Monatscher für Ohrenheilkunde* No. 19, 1902), also reports a case of improvement in a sarcoma of the pharynx as the result of a streptococcus and staphylococcus infection.

Sarcoma of the pharynx in adults will not be considered in the writer's paper.

Emerson has recently reported a case in an adult in which the use of Coley's toxins resulted in the practical disappearance of the growth. There was a recurrence and death after seventeen months. (*Laryngoscope*, March, 1907.)

There are also several cases on record in which the arsenic treatment resulted in some improvement. I could not find any record of its having been used in sarcoma of the pharynx in children.

XXX.

NON-RECURRENT CARCINOMA OF THE LARYNX (REMOVED THROUGH THE NATURAL PASSAGES).*

BY E. FLETCHER INGALS, M. D.

CHICAGO.

The results of treatment in carcinoma of the larynx are generally so bad that it is a pleasure to be able to report a case in which there has been no recurrence of the growth for over a year after its removal by endolaryngeal methods, even though nothing in the operation or treatment of the case can be presented as of special interest.

The patient, K. P., was a laborer, 44 years of age, who came to me on the 2nd of January, 1906, complaining of marked hoarseness which had lasted for 6 years. There had been no pain until within the previous three weeks, during which time he had suffered some pain in the region of the left half of the hyoid bone. He was not conscious of having taken any cold, but stated that he had catarrhal symptoms for some time and that the nasal cavities had often been obstructed, although at the time of his visit they were better. His general health was good. There was no dyspnea, the appetite and digestive organs were normal. He stated that the hoarseness had been variable; sometimes having been so bad that he could talk only in a whisper, his voice, at other times, being much stronger, but continually hoarse. There was nothing in the hereditary history to account for the condition, and there was no evidence whatever of lues. The patient's habits were good; he had formerly smoked tobacco but had given it up three weeks before he called upon me, and he had never been accustomed to inhaling the smoke. He stated that his usual weight was 165, and he weighed 163½ at the time of his first visit. The temperature was normal, pulse 68, regular and normal. There was hoarseness and a slight hacking cough, but no dyspnea. Upon inspection I found the nasal cavities about half closed by swelling of the turbinated bodies, but this gave him

*Presented at the American Laryngological Association, Washington, 1907.

no inconvenience. There were no thoracic symptoms. Inspection of the larynx showed a pinkish gray tumor involving the anterior 5-6 of the left vocal cord, filling the opening of the ventricle and extending inward so as to considerably obstruct the glottis, and crowding outward into the ventricular band. This was about 15 mm. long by 8 mm. wide and apparently about 6 mm. in thickness. Some blackish areas on the surface were apparently caused by coal soot. The growth had the appearance of malignancy but it had been present so long that I hoped it might be a simple papilloma. I removed the greater part of it at the first sitting and submitted it to Prof. E. R. LeCount, of Rush Medical College, for examination. After the operation, I directed the patient to keep an ice pack on the neck for 24 hours. He returned two days later, and at that time I was able to see the greater part of the left cord perfectly, but a small part of the growth, about 6 mm. in diameter, remained at the front end of the cord, and a piece somewhat smaller at the back end. At this time I removed all remnants of the growth from the back end of the cord and about half of that from the front end, but could not secure all of it because of the bleeding. The patient returned two days later, at which time he complained of considerable soreness of the larynx, therefore I merely applied a mild solution of zinc sulphate. A similar application was made at the next visit two days later. I did not see him again for a week. In the meantime I had received a report from Prof. LeCount that the neoplasm was a slowly growing carcinoma, with growth toward the surface and considerable keratohyalin transformation of the epithelial cells. At this time I found a growth at the anterior end of the left cord larger than at the last visit, and I removed it thoroughly with a special Mackenzie forcep. After removing this, I found there was a growth of about the same size just below the vocal cord. This I also removed with Mackenzie forceps. I again advised the cold applications to the throat. When he returned four days later he was very hoarse. There was about 15 per cent congestion of the left cord and about 5 per cent of the right. Some roughness of the edge of the left cord, which had been noticed at a previous visit, had disappeared, and no remnants of the growth could be discovered. A mild astringent application was again made. When I again saw him, eleven days later, the left cord was still swollen and the congestion of both cords

was a little more pronounced than it had been at the previous visit. I gave him a small inhaler charged with 5 grains of iodine and 20 grains of menthol, which he was directed to use five or six times a day. This he continued for several months. Two weeks later there had been no reappearance of the growth, but the congestion in the larynx was still more than when I had last seen him. He stated that he had just suffered an attack of influenza, which probably accounted for the increased inflammation. I directed the inhalation to be continued and made a mild astringent application to the larynx. I saw him again in a little over three weeks, at which time the congestion had considerably diminished. Three weeks later the voice was noted to have been clearer, and the patient stated that he was at his regular work daily. I did not see him again for a little over two months, at which time it was noted that the voice was continually growing clearer, and he stated that he could sing, something that he had not been able to do before for many years. The cords, however, were still congested about 8 per cent and both of them were slightly thickened. There was no return of the growth. I did not see him again until January 28, 1907, over a year after the operation. He had been on the Pacific Coast for several months, and stated that for the last three or four months his throat had been perfectly well. His voice, he said, was as good as it ever had been. I found no evidence of return of the growth. In response to a letter he called again on the 14th of February, at which time he stated that the voice continued as good as ever. I found, however, there was slight thickening of the vocal cords and congestion of about 15 per cent, apparently due to a recent cold; however, there was no evidence of any return of the growth. Although interference with malignant laryngeal tumors is likely to stimulate their growth, it appears to me that when there is doubt of the pathology and conditions are such that we have a hope of removing the neoplasm thoroughly by the endolaryngeal method, this operation should be chosen. If microscopic examination reveals malignancy and the tumor returns, laryngotomy or laryngectomy should be at once advised, if there is reason to believe that a thorough removal can be affected.

34 Washington Street, Chicago.

XXXI.

MODERN SURGERY OF THE FAUCIAL TONSIL.*

BY THOS. J. GALLAHER, A. M., M. D.,

DENVER, COLO.

As the success of any surgical procedure is dependent upon an accurate knowledge of the anatomy of the part, I beg the indulgence of this society while I briefly describe the surgical anatomy of the tonsil and its surroundings.

The sinus tonsillaris is a triangular area on the lateral wall of the pharynx, bounded anteriorly by the anterior palatine arch; posteriorly by the posterior palatine arch; externally by the superior constrictor of the pharynx; and below by the side of the pharyngeal portion of the tongue; above it is limited by the junction of the two arches. It contains the tonsil.

At the junction of the two arches, a reduplication of the membrane is found, the plica triangularis, which covers the supratonsillar fossa. As the membrane covering the anterior and inferior portions of the tonsil is also called the plica triangularis, some authors call this plica above the tonsil the plica supratonsillaris, which avoids confusion. The plica supratonsillaris, hence, bounds the supratonsillar fossa above with its semilunar margin. It has an anterior and a posterior cornu, which are continuous respectively with the anterior and posterior pillars. The plica tonsillaris inferior is reflected from the mucous membrane of the anterior pillar upon the tonsil, covering it anteriorly and extending along its inferior border for a variable distance, often reaching the posterior pillar. At the point where the plica is reflected upon the tonsil, a sharp angle is formed by the plica and the anterior pillar, which may properly be called the commissure of the anterior tonsillar fossa.

The tonsil, together with the different reflections of the mucous membrane, forms with the arches three distinct fossae; viz., the anterior, supratonsillar and posterior.

*Read at the Thirteenth Annual Meeting of the American Laryngological, Rhinological and Otological Society, New York City, May 30, 1907.

The anterior fossa is bounded in front by part of the anterior pillar; above by the commissure of the anterior fossa (or point of divergence of the anterior palatine arch and plica triangularis); posteriorly by the anterior border of the tonsil (with its plica); below by the tissues of the side of the tongue. The supratonsillar fossa is bounded above by the semilunar margin of the plica supratonsillaris; anteriorly and posteriorly by the anterior and posterior cornua of the plica supratonsillaris; below by the superior margin of the tonsil. The posterior fossa is bounded anteriorly by the posterior border of the tonsil; above by the commissure; that is, the point of divergence of the mucous membrane of the posterior pillar and the membrane reflected from it upon the tonsil; posteriorly by the posterior arch; inferiorly it is continuous with the lateral wall of the pharynx. The anterior fossa is always present and is usually of considerable size. The superior fossa is also constant and quite variable in its extent. The posterior fossa is not so distinct, but can usually be made out. The anterior and posterior pillars are formed by the projection of the palatoglossi and palatopharyngei muscles covered with mucous membrane. The posterior pillar on each side is nearer to its opposite arch than is the anterior to its opposite, consequently the posterior pillar covers much more of the tonsil than does the anterior. It is owing to this fact that the posterior fossa is limited in its extent.

The distribution and direction of the tonsillar crypts perhaps influence us most in determining the extent of the tonsil operations. The crypts in the superior portion extend downward and outward to the capsule and are often closely covered by the plica supratonsillaris. The crypts in the middle and lower portions of the tonsil extend more horizontally and upward. The middle and lower crypts are, therefore, more easily drained than the upper crypts. It is from the upper crypts usually that infection produces peritonsillar abscess. It is of greatest importance that the velar or superior lobe of the tonsil should be removed to prevent a recurrence of this infection. The crypts are both simple and compound and extend from the surface of tonsil externally to the capsule. The capsule is the fibrous membrane covering the external portion of the tonsil and is loosely attached to the superior constrictor.

We shall briefly call attention to the blood supply of the tonsil. The arteries supplying the tonsils are the dorsalis linguae from the lingual, the ascending palatine and tonsillar from the facial, the ascending pharyngeal from external carotid, the descending palatine branch of the internal maxillary and a twig from the small meningeal.

The point of practical importance in regard to the blood supply is that the arteries pass external to the superior constrictor, through which they continue and then divide into the smaller vessels, which enter the tonsil through the capsule, hence care should be exercised that none of the vessels be wounded far from the capsule. Normally, the internal carotid artery lies behind and to the outer side of the tonsil, nearly an inch distant from it, in the posterior portion of the pharyngomaxillary interspace. Barring an anomalous position of the internal carotid, which will be shown by the visible pulsations of the tonsil, this vessel is not at all likely to be wounded. The veins terminate in the tonsillar plexus in the outer and lower portion.

A branch of the glossopharyngeal nerve, by uniting with branches of the pharyngeal plexus, forms the tonsillar plexus.

The excellent work of Goodale, Wright, Ballenger, Myles, Mosher, Wood, Robertson, Babbitt and others has given the proper status to the normal and diseased tonsil. There is no longer any doubt that many infectious germs gain entrance to the system through the tonsil. It is, indeed, a sign of the times that the so-called rheumatic attacks following acute tonsillitis have been placed in the category of septic infections.

Operations upon the tonsil may be divided into the simple type of operations and the radical tonsil operation. Among the simple operations may be included the slitting of the crypts by the knife or galvano-cautery, reduction of the tonsillar tissue by the galvano-cautery and, lastly, tonsillotomy. These operations are seldom of choice, and are usually done only when it seems most expedient under existing circumstances. As an example, it is better to reduce a hypertrophied tonsil by means of the galvano-cautery rather than to do the radical operation when any doubt exists as to the position of the internal carotid or any large anomalous vessels. As to tonsillotomy, it is certainly a most incomplete operation, and its results are very often most disappointing. The tonsillotome soon will be seldom used.

The radical tonsil operation consists in the complete extirpation of the sinus tonsillaris. As radical operations are rather in favor today, I take the liberty of using the term in reference to the tonsil. There is no more reason for doing an incomplete tonsillar operation, when its removal is indicated, than there is for imperfectly performing any surgical operation. While many operators have been very careful to remove all of the diseased mastoid cells, they but partially remove the diseased tonsillar tissue.

We will not discuss the indication for removal of the tonsil, but when its evisceration is attempted the radical operation only should be done. It is only such work that will prove satisfactory to both the sufferer and operator. We can assure our patients perfect immunity from tonsillitis, peritonsillar abscess and the serious constitutional disturbances. Indeed, the failure to bring the desired relief by the partial removal of the tonsil has brought upon the laryngologist much just criticism. In the institutions in our larger cities today, it is still an exception to find an operator who is doing a complete radical operation. Great credit should be given to Ballenger, who has been advocating for years the complete removal of the tonsil. The first complete enucleation which I saw was performed by him was some years ago. Since coming to this meeting, he tells me that he has still further improved his technic, which I hope he will describe in his discussion before the society.

Every operator will, of course, have his favorite method, and many technics have been given to the profession within the last few years. A large number of instruments have been devised for the purpose, including knives, scissors, various punches, snares, etc.

In performing the radical operation I, personally, use the following: A suitable tenaculum forceps, the Pierce knife, the Kyle crypt knife which has long been recommended by Ballenger, and a slight modification of the Peter's snare. The operation may be called the dissection and snare operation. The snare is often improperly used and should never be placed around the tonsil without a thorough loosening of the organ from the sinus tonsillaris. It matters not about the shape of the tonsil or as to the amount of the tonsillar tissue projecting beyond the pillars. This operation will always be found applicable and thorough. In the adult, when operating without general anesthesia, we inject a mild solution of cocaine

and adnephrin or adrenalin along the line of incision, waiting one minute and proceeding. In children under general anesthesia, occasionally we inject a weak adnephrin or adrenalin solution or apply locally.

The tonsil is first seized with a tenaculum forceps and drawn internally to accurately show its outline. An incision is then made with the Pierce knife along its posterior border, which quickly and easily frees it from its attachment. This incision extends from the lower margin of the tonsil along its posterior border to the commissure of the posterior fossa. The Kyle knife is then used, cutting through the posterior commissure, and extending the incision over the upper margin of the tonsil; that is, through the supratonsillar fossa. Next an incision is made with the Kyle knife along the inferior attachment of the tonsil and extending upward, separating the plica triangularis inferior along its outer boundary to the commissure. This is continued upward through the commissure and joins the upper incision in the supratonsillar fossa. After these incisions are made, the tonsil is no longer held within the sinus tonsillaris, and a slight traction on the forceps, toward the median line, will cause a beautiful eversion of the tonsil, so that the capsule of the tonsil, which is loosely attached to the constrictor, is drawn internally to about the same plane as the anterior pillar. The dissection can then be continued directly backward, and, also, further liberation of tonsil made along its superior margin. The entire tonsil can be dissected out by means of these knives, but the use of the snare facilitates the operation somewhat and possibly lessens the danger of hemorrhage. We use the No. 7 piano wire and a slightly modified Peter's snare, with no tips, and find that the plain wire can be much more easily insinuated external to the capsule. The same wire can be used for both tonsils. The tonsil is usually removed completely with its capsule intact. After the operation, the sinus tonsillaris should be carefully inspected with a small forceps to see if any fragments of the tonsil remain, especially in the upper portion. If any are found they should be removed.

Dangerous and Faulty Technic: The plica supratonsillaris should be cut through only at the anterior and posterior cornua and not through the semilunar margin.

Laceration of the constrictor and wounding of the larger vessels external to it, which would produce very troublesome hemorrhage.

Cutting of the palatoglossi or palatopharyngei muscles which will certainly give contractions of the palate. The contractions are more liable to be produced by the laceration of the posterior pillar.

Incomplete severing of the marginal attachments which permits the surrounding tissue, especially above, to be drawn into the snare and wounded.

Insufficient loosening of the capsule from the constrictor.

Too much stress cannot be placed upon the importance of the careful dissection of the velar lobe from its attachments, as it is common for the inexperienced operator to leave much of this lobe in the sinus. Hence, it is wise to always inspect the sinus, as suggested above.

In a record of over one hundred and twenty-five cases, in the adult, by this method, the only bleeding that we have had has been incidental to the dissection, and in each instance, after the snare had completely enucleated the tonsil, the bleeding stopped spontaneously. My experience has been that it is in the cases of incomplete removal of the tonsil that the serious hemorrhages occur, the soft tissues preventing proper retraction of the vessel. In children, I prefer general anesthesia.

The technic as described above requires simple and few instruments, and certainly insures a most thorough evisceration.

While the radical tonsil operation requires much care and a keen appreciation of the anatomy, I am satisfied that when any operator has become proficient in its performance, that there will be but one operation which he will do for those suffering from diseased tonsils—the one which will positively insure immunity from any further inconvenience—the one which will be a boon to his patient and a satisfaction to himself—namely, the radical tonsil operation.

XXXII.

REPORT OF CASE OF TRAUMATIC ETHMOIDITIS— CEREBRAL ABSCESS—DEATH DURING OPERATION—AUTOPSY.

By J. A. STUCKY, M. D.,

LÉXINGTON, KY.

The following unique case is presented for your consideration, believing it to be one of a class of cases in which the accessory sinuses of the nose are involved, that calls for more than a passing notice.

A. F., aet. 16, living in the mountains of Kentucky, was admitted to the Good Samaritan Hospital on August 13, 1906, having fallen from a fence four feet high, four months previously, striking her nose on a piece of timber, fracturing the nasal bones—pieces of bone coming out of anterior nares two weeks later. Complains of constant pains through the head, more severe at times, especially when stooping or jarred. Pain through eye, especially left one, which is almost blind. Convergent strabismus of the left eye: V. R. 20/20, V. L. 20/80. Pain on deep pressure over left eye, particularly over temples. General health below par. Much cough. Unable to use ophthalmoscope on account of irritability, fighting, etc. Family history good. Transillumination of frontal sinus positive. Antrum negative. Vertigo when stooping, pain and dizziness increased when blowing nose. Bridge of nose swollen and tender. Every evidence of fracture. Examination of anterior nares showed cartilaginous septum torn from the vomer, pushed over against the middle turbinate, the middle turbinate adherent to antral wall and pus oozing from above and below tip. Posterior nares full of pus. Probe shows roughness and degeneration of ethmoid cells. On August 15th, under general anesthesia, the septum was straightened, the middle turbinate removed, granulations and pus removed, anterior ethmoid cells and sphenoid sinus curetted. Four days later, strabismus relieved, vision normal, complains of no headache. Did not see patient again for a week. September 4th: Pain increasing for past few days. Nose swollen, discharge ceased. Vision R. & L., 20/15.

+1.25 D., equaling 20/20+. Ophthalmoscope shows edematous retina and papillary neuritis. Is irritable, despondent, threatens suicide. Complains of constant and increasing pains, relieved by cocain and adrenalin sprayed into the nose.

September 5th: Complains of more pain. Pulse 64, temperature 98. No appetite, restless and very irritable, hysterical; laughing, moaning, crying alternately. Respiration, shallow. Dr. G. P. Sprague called in consultation. Decided to wait twenty-four hours, and explore accessory sinuses. One-twelfth grain heroin given hypodermically.

September 6th: Had a good night, is brighter, less irritable and despondent and anxious to have operation. Is prepared for operation by free purgation, followed by baths and enema. At 1 o'clock nurse reports that she has another hysterical attack. At 2:45 I saw her, respiration jerky and shallow, tossing head and throwing arms; would reply to no questions. Pupils still partly dilated, but reacted equally to light (had homatropine twenty-four hours before for refraction). forehead, eyes and upper part of face slightly edematous and cyanotic. General condition bad, but symptoms of pressure increasing, patient was taken to operating room. Condition improved under ether, requiring unusually small amount for narcosis. Postnasal tampon inserted. Nasal cavity and ethmoid and sphenoid examined. Granulation tissue and slough removed with curette. Very little bleeding from nose. Incision for Killian's radical operation on frontal sinus was made; the edematous tissue bled freely, and was controlled by retractors. Periosteum was very dark color, much thickened and very soft when removed. Continuous and rapid bleeding from bone for a space around nasofrontal articulation size of a silver dime. At this point the outer table of frontal sinus, which was unusually soft, thin and vascular, was removed with a chisel, and the entire sinus, which was of exceptionally large size, was filled with firm, organized clot, which was disintegrating in spots. When the clot was removed, the respiration suddenly ceased, and notwithstanding that all the known methods of restoration were used by Drs. Estill, Sprague, Griggsby and myself, the patient never rallied. Death was practically instantaneous. Artificial respiration was continued for nearly two hours. Normal saline solution injected intravenously, strychnia and atropin given hypodermically.

Notes of Dr. G. P. Sprague, neurologist: "Patient, Amanda F., September 5th, was seen at Good Samaritan Hospital.

Is a large, well developed white girl, age 16, of fair nutrition, symmetrical build and intelligent appearance. Is anemic, pulse varies from 80 to 85, of fair volume and regular. Respiration normal, temperature 97° , pupils equally dilated by homatropin, tongue protruded without deviation or tremor. Both knee jerks absent, even when reinforced. No ankle-clonus nor Babinsky reflex. Stands fairly well with feet together and eyes shut. Complains all the time in whining, sing-song groan of pain in the left half of the forehead, from the midline to the ear, and has not had pain anywhere except over the entire frontal bone, where the pain is sometimes worse on the right than on the left. Nose is swelled, but not sore. Pressure on right frontal region causes pain in left temporal region. Talks quietly for a minute. Laughing and joking with the nurse, calling to nurses whose step she recognizes about the ward and then suddenly groans and whines for ice, to have her head rubbed, to be fanned, etc. Pettishly refuses to write her name or anything else, though admitting that she can write. Says she won't if she is asked all day, and that she never does anything when she says she wouldn't. Has no symptom of either motor or sensory disturbance, except as noted. Diagnosis, cerebral abscess or meningitis, caused by inflammation and pus in the frontal and ethmoidal sinus, leaning to the latter.

"Autopsy twenty hours after death. Only the brain was examined. There was no fluid in the ventricles, no apparent disease of the dura or the pia arachnoid, except over the left cribriform plate and in the sella tursica, where the pia and dura were both adherent. The left cribriform plate was necrotic, with a fracture through the inner table of the left frontal sinus. The entire anterior and middle cerebral convolutions softened and infiltrated by pale green pus of creamy consistency. Just internal to the cribriform plate in the anterior convolution, there was a thick, tough, gritty substance, the remains, apparently, of an abscess cyst wall, holding approximately one dram, while there must have been several ounces of pus altogether. The abscess had evidently ruptured into the brain substance, but there was no indication that it had been connected with any sinus or other cavity."

The interesting features of this case are: (1) The extreme rarity of an injury to the nose resulting in infection of ethmoid cells and frontal sinus. (2) The mental symp-

toms caused by the resulting septic condition. (3) The strabismus and amblyopia caused by pressure in sphenoidal sinus, which was relieved as soon as the pressure was released. (4) The absence of focalizing symptoms, even when so large an area of the brain is involved in so decided pathological condition. Query: Given a similar case, what would be the best operative procedure? Would I have been justified in searching for cerebral abscess with no more focalizing symptoms than presented by this case? It is greatly desired to have the counsel of the neurologist in cases like this, and others in which we have marked mental symptoms accompanying suppuration of the nasal accessory sinuses.

XXXIII.

A CASE OF ADENO-CARCINOMA, SITUATED IN THE RIGHT MAXILLARY ANTRUM, REPORTED ONE YEAR AND A HALF AFTER OPERATION.

BY LEE MAIDMENT HURD, M. D.

NEW YORK.

C. F., aged 59, U. S.; occupation, milkman, previous history clear; first seen on December 6, 1905, when he gave the following history: Twelve to fourteen months ago he began to notice swelling of the face and hard palate. For the past ten years, he says, he has had a small swelling on the alveolar process. The teeth on that side fell out about five years ago, also some on the opposite side. The only subjective symptom which the growth gave was nasal obstruction. The growth, where it had broken through the bone, had a cystic feel. The swelling in the mouth has obliterated the usual landmarks, and was one smooth swelling from the gingivo-labial fold well beyond the median line, involving the alveolar process as far as the left canine tooth. The anterior surface of the growth markedly bulged the cheek on that side, and overrode the infraorbital ridge and the nasal bone. The naso-antral wall bulged into the nose, and pushed the septum over until it touched the opposite side. The growth had caused absorption of the bone in several directions, namely, the anterior and inferior antral walls, and probably the nasal walls. His heart and lungs were normal, kidneys slightly congested. He had been a steady whiskey drinker for years, averaging ten drinks daily.

December 9, 1905, operation. The external carotid was ligated. Some slight delay was caused here by the bifurcation arising rather high up under the hypoglossal nerve. I believe the ligation of the external carotid to be an important step in all growths of the nose or upper jaw, inasmuch as it saves shocks from hemorrhage, and causes an after-anemia that discourages immediate recurrence. It also gives one an opportunity to inspect and remove any suspicious glands that otherwise would not be recognized.

The Weber, or Fergusson, incision was made—that is, along the infraorbital ridge to the inner angle of the eye, then down the junction of cheek and nose, following closely the boundary of the nose, until the median line is reached, then dividing the upper lip. On reflecting this flap, the periosteum was found to be adherent, so instead of trying to separate it, I went through the tissue of the cheek. The periosteum of the orbital floor was easily elevated; the growth had not bulged into the orbit, but the nasal process of the superior maxilla and nasal bone were softened. They were removed with bone forceps, and the separation of the bone was extended back through the orbital floor to the sphénomaxillary fissure. This bone is very thin and can be easily divided, care being taken not to injure the orbital tissues. Next a Gigli saw was passed through the sphénomaxillary fissure out the nasal fossa, and the malar bone was divided in about the line of the sphénomaxillary fissure. Next the hard palate, from a point between the second incisor and the left canine tooth was divided directly back to the soft palate, and also the nasal septum through the anterior naris was separated from the hard palate. This was done with a chisel, as the quickest method. The soft palate was separated from the hard with a right angled knife. The superior maxilla was then easily removed.

The ligated external carotid made the procedure practically bloodless, not a ligature being used. The wound was closed and the cavity was packed with iodoform gauze, which was held in place by fixation sutures from the hard palate through the tissues of the cheek. Duration of operation, 50 minutes.

The patient suffered no shock. The iodoform gauze was removed on the second day, and was not replaced. To my surprise, he could drink fairly well, notwithstanding that the cavities of the nose and mouth were practically one. He went on to complete healing, without after treatment of any kind, except an antiseptic mouth wash.

The growth was submitted to Dr. Jonathan Wright for examination, who reported as follows: "This growth is an adenoma. The interest, both clinically and histologically, is whether we are to consider it malignant or benign. In many places the type is one of simple row formation, run wild, but not clustered into irregular clumps or cells, which in this kind of case I have been accustomed to associate with malignancy. In several of the places, however, this massing of the cells in

the stroma is evident. In these localities, and a few others, a little suggestion of gland structure is to be noted. In other places the cells are arranged around a blood vessel for a center. In these sections, I do not make out any of the irregular karyokinesis, which is a striking intracellular feature in malignant growths. From my experience with such cases as this, I am inclined to think, in spite of several very dubious areas, that there is a good chance that this growth, even with repeated recurrences, may finally be entirely and permanently eradicated. If possible, the site of the growth should be promptly exposed, so that any recurrence may be observed and extirpated."

December 21, Dr. Wright sent me this supplementary report: "On examination of other portions of this growth, I am inclined to think we must give up any hope of its clinical non-malignancy. There is too much atypical proliferation not to expect prompt recurrence and metastases."

On the strength of this latter report, I thought I would take time by the forelock, and immediately had the wound X-rayed twice a week for three months, with the idea that, if there remained any abnormal cells, or any should re-form, the over-stimulation of the X-rays might destroy them.

Now, at the end of eighteen months, there is no sign of recurrence, and the nasal mucous membrane has accustomed itself to food and condiments, so that articles like vinegar, pepper, whiskey, etc., do not seem to irritate the membrane covering the turbinates. This membrane is not congested, and, if anything, the color resembles the buccal membrane rather than the normal nasal membranes.

The resulting deformity is very slight. The most noticeable thing is ectropion of the lower lid. He has now a prosthetic plate, which restores the normal voice. The eye has dropped some, his diplopia is so great that he entirely disregards the second image.

What has this non-recurrence proved? Was it due to the X-ray. I think not, even though the rays in this case were fairly well directed upon the wound surface—as the X-rayists are mostly of one opinion, namely, that the rays are not of much value in carcinomatous conditions.

Was Dr. Wright's first opinion correct, and not his second report? I have the highest regard for Dr. Wright's opinion, and think he probably was right when he said: "On further examination of the growth, it was probably malignant."

May not the good results in this case be due to the radical operation? The operation was carried well into healthy tissue on every side of the growth. Most of the cases of adenoma or adeno-carcinoma of the nose have been simply curetted out, and nearly always have been followed by recurrence, until after many curettings the patient died.

15 East Forty-eighth St.

XXXIV.

A SECOND REPORT ON A CASE OF EPITHELIOMA OF THE UVULA OPERATED FIVE YEARS AGO. WITHOUT RECURRENCE.

BY JAMES F. McCaw, M. D.,

WATERTOWN, N. Y.

This case of primary epithelioma of the uvula and soft palate was seen in consultation on November 19, 1901, through the courtesy of Dr. E. S. Willard, of Watertown, N. Y., a detailed report of which will be found in the transactions of this society for 1902. I will here briefly rehearse the important points in the case that we may better understand the nature and extent of involvement when first seen.

The history of obscure abdominal growths in two sisters, one of whom died from an attempt to remove the growth several years before. The patient, a female, had always enjoyed good health, and with no other throat difficulty, except an occasional attack of quinsy. Her present trouble began about eight months before coming under observation with soreness and slight throat irritation. In a short time several small ulcerations were noticed on the soft palate. Under treatment for "cancerred sore throat" these seemed to improve, but never entirely disappeared. About October 1, 1901, the soft palate began to enlarge and very rapidly fill the throat. This was quickly followed by dysphagia, pain, muffled intonation and soreness in the cervical muscles. Six weeks later, when first seen by the writer, a mass involving the uvula, soft palate, posterior faucial pillars, the right lateral and a portion of the posterior pharyngeal wall was seen. The mass almost filled the right side of the pharynx, presented an irregular modulated outline ulcerated and necrotic surface and a dense, cartilaginous feel to the touch.

*Read at the annual meeting of the American Laryngological, Rhinological and Otological Society, New York City, May 30, 31 and June 1, 1907.

The treatment employed was thorough excision of the growth with electro-cautery knife, curetting, and deep cauterization of the raw surfaces, and subsequent irradiation with the Roentgen Ray. After two operations, according to the above method, the last, March 7, 1902, followed by exposing the areas to the influence of the X-ray, **the parts healed kindly after about twelve weeks of such treatment.**

This case has been kept under constant observation and regularly examined at intervals of about six months ever since, either by her family physician or myself, and at no time has there been the slightest indication of a recurrence. From a weak, frail, anemic and despondent individual, she has gradually developed into a hardy, robust and cheerful person, gained thirty pounds in weight, and is in better physical condition than for years. The palatal and pharyngeal muscles functionate with perfect ease, the scar tissue is scarcely noticeable, the only apparent deformity being the loss of the uvula, and slight tension of the velum palati, the posterior faucial pillars forming a narrower arch.

In view of the fact that this patient has remained free from the slightest indication of a recurrence for a period of five years, we are warranted in assuming that the original process has been adequately removed.

In this connection the question arises in my mind: May we not have different degrees of malignancy inherent in growths, pathologically of the same type? The same, for example, as we have different degrees of severity in cases of diphtheria, typhoid fever, follicular tonsillitis and a host of other conditions. This, together with the variable resisting power of different individuals would theoretically account for the cases of reported cures of malignant disease. The whole question of malignancy—where it begins, where it ends and its etiology—is still so indefinite that we are unable to say the length of time that must elapse before a recurrence or metastases are improbable. Until we have more exact knowledge of these important factors, we think it wise not to report our cases of malignant disease as cured, but as having remained so long without a recurrence or metastasis. My case today, after five years, is still without a local recurrence or discoverable metastatic deposit.

THE IMPORTANCE OF AURAL INSPECTIONS AND
FUNCTIONAL TESTS IN HEALTHY
INDIVIDUALS.

A PLEA FOR THE PREVENTION OF DEAFNESS.

BY W. SOHIER BRYANT, A. M., M. D.,

NEW YORK.

No organ of the human body can undergo greater deterioration without knowledge of its possessor than the ear. It is not at all unusual for an otologist to observe patients who complain of some other defect than hearing and who do not consider themselves deficient in this respect, although their hearing distance is less than one-tenth of normal. According to the law that the intensity of sound varies as the square of the distance, these people have less than one per cent of normal sound perception. Man inherits much greater acuteness of hearing than he is called upon to use if he lives in a civilized community. Consequently, he does not notice the loss of the accessory increment of this sense, and is able to dispense with all but a very small fraction of his natural hearing, even to below one per cent, without interference with his daily life. If one ear has normal hearing, the other may lose all its hearing power without the knowledge of the individual, unless his attention is called to the fact by some peculiar circumstance interfering with the function of the good ear.

The acuteness of normal hearing may be described by a curve which rises from zero at birth, attains its maximums at the completion of adolescence, and gradually declines to a very low point in old age. If anything prevents the normal rise of the curve during adolescence or depresses it to a point below normal, the subsequent curve is parallel to the normal, approaching the abscissa at an early period, and causing premature loss of efficient hearing. Usually chronic defects in

*Read at the Annual Meeting of the Medical Society of the State of New York, Albany, January 29, 1907.

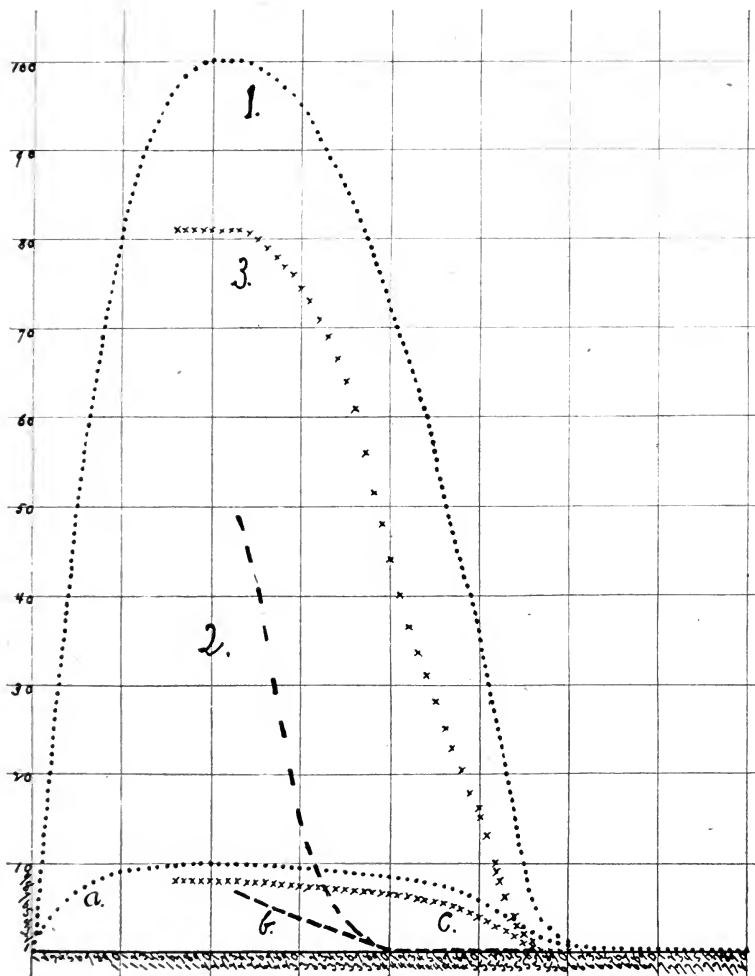


DIAGRAM.

The line at the base of the diagram indicates the abscissa of hearing and the numbers thereunder the age of the subject. The lower numbers on the scale on the left indicate the ordinate of the hearing distance, the maximum being 10. The higher numbers indicate the hearing power, being the square of the distance.

a.—The curve of the normal hearing distance. 1. The curve of the normal hearing power, which is the square of a. Both curves reach their maximum in the 19th year, continuing there till the 25th year, when they begin to fall.

b.—A curve of the hearing distance. Here there is a diseased condition of the ears, untreated. The curve begins with a sudden drop in the 23d year, reaching 0 about the 40th year. 2. The curve of hearing power under the same conditions.

c.—A curve of the hearing distance. Here the hearing has been affected by some accident or non-progressive disturbance of hearing, without treatment. The curve begins with a sudden drop in the 15th year. From this point its course is nearly parallel to a. 3. Is the hearing power of c.

hearing do not tend to spontaneous recovery or even to a position of status quo, but on the contrary are likely to grow worse. In these cases, the descending curve, instead of falling parallel to the normal, drops much more abruptly, causing a still earlier loss of hearing than would otherwise obtain.

There is an important difference between the sense of hearing and that of sight, which explains the fact that a considerable diminution in hearing power may occur without the patient's knowledge, whereas, a much smaller loss of sight would cause serious annoyance. The power to hear decreases as the square of the distance or in proportion to the intensity of sound. Sight decreases in proportion as defects in the transparent media cloud the details of the object, thus emphasizing slight imperfection of the sense organ. With hearing, on the other hand, it is a question of volume of sound, as long as the volume is sufficiently loud to be perceived, no defect is noted by the individual.

Since hearing may be lost to a large extent before any notice is taken of it by the patient, his cognizance of the loss is an indication of considerable functional impairment, the result of proportionately advanced pathologic processes, which are proverbially hard to check and the effects of which are still more difficult to eradicate.

The chief reason these conditions resist treatment is that the pathologic processes have gone so far by the time the loss of hearing is sufficiently great to attract the patient's attention.

Most cases of deafness occurring in middle or later life are due to so-called chronic middle ear catarrh, in which there is a gradual process of fibrosis, atrophy and degeneration affecting the drum membrane and the contents of the middle ear. This results in sclerosis, loss of normal cell elements and deposition of lime salts, conditions which can be combated successfully in their incipency, but which, when the tissue changes are long standing and extensive, make stubborn resistance, just as similar conditions would affect the eye, or any other organ.

Chronic suppurative diseases of the ear are the cause of most of the remaining cases of deafness. This affection is dangerous to life as well as detrimental to hearing. The decrease of hearing is in proportion to the destruction of the tissues of the sound-conducting and sound-perceiving mechan-

isms of the ear, and becomes greater with the continued formation of pus. The parts which are lost in the ulcerative lesion consequent to the suppuration cannot be restored any more than can other joints, bones, or tissues which are lost in a similar way; therefore, the restoration of the hearing even after the suppurative process has been arrested, is largely, except for the cessation of inflammation, dependent upon mechanical appliances rather than upon restoration of any of the lost parts. This is true with the exception of the drum membrane which has a remarkable power of repairing its defects by substituting a cicatricial membrane for the parts destroyed. The suppurative process may be so slow and the ulcerative destruction of tissue may go on so imperceptibly that the patient does not realize his condition. Carious destruction of bone may progress under these circumstances, even to exposure of the meninges without any definite subjective symptom save an occasional headache. Early examination of the ears will detect the cause of insidious loss of hearing most dreaded by the otologist, namely, rarefaction of the labyrinthine capsule—a disease which, taken in time, offers fair hope of arrest before the damage is irremediable.

Accumulations of cerumen in the external auditory canal do not interfere markedly with hearing until the canal is hermetically closed. But their presence is detrimental to the healthy condition of the canal and middle ear. The diagnosis of osteomata, which are the commonest new growths to cause occlusion of the canal, is readily made on inspection, and treatment is satisfactory in its results. If these growths are allowed to close the canal, the danger to the individual is considerable, not only because the patient loses the hearing in the ear for the time being, but also because of the irritation which this stoppage engenders, and the consequent suppuration of the middle ear.

Parasitic growths, such as the aspergilli, may exist in the external meatus and flourish there without causing any special symptom until they penetrate the deeper layers of the epithelium. The violent inflammation which results is not only distressing to the patient, but by perforating the drum membrane and infecting the cavities within, invades the middle ear and mastoid cells.

Besides the destruction of the tissue of the ear and the diminution of hearing distance which may occur without the

knowledge of the patient, he may unconsciously suffer curtailment in the range of his hearing. The perception for notes at either end of the scale is sometimes lost or there may be blanks anywhere. The higher notes which are rarely used in daily life, may be completely lost as well as the lower tones. Unless a person is a trained musician a considerable deficiency may not be recognized. Decreased high-tone perception indicates serious labyrinthine changes which may not be suspected until the middle register is interfered with. Decrease of low-tone perception is consequent upon disturbances in the sound-conducting apparatus of the middle ear. Deviations from the normal range of sound perception indicate pathological conditions which, if unchecked, are apt to progress and cause still greater defects.

It is customary to seek an otologist's advice when there is an acute aural disease, or when there is enough loss of efficient hearing to cause much inconvenience, which, as we have seen, indicates very far advanced pathologic changes. It is not generally understood that changes in the ear, unlike the eye or other organs of the body, may progress and cause serious damage before their presence is suspected by the patient. The patient usually does not seek advice until he can no longer carry on his daily vocation when the hearing is so bad that the effort to listen has become a serious burden. I maintain that more can be accomplished by prophylactic watchfulness of the ears than by similar care of other parts of the body. Vertigo, tinnitus, deafness, and the danger of systemic infection and intracranial lesions from chronic suppuration can commonly be prevented if the morbid changes in the ear which cause them receive adequate treatment in their incipency.

The subjective feelings of the patient, or tests carelessly applied are very uncertain and misleading because the results are so largely affected by mental bias and preconceived estimate of the conditions present. The only way to determine the actual condition of the hearing distance is that of careful, scientific tests.

If the ear is examined it will give early indications of impairment of function, either of the sound-conducting mechanism (middle ear disease), of the sound-perceiving mechanism (labyrinthine disease), or of the nerve itself (neuritis or pressing tumors), or of the auditory centers (intracranial dis-

turbances), or of the whole nervous system, as in neurasthenia.

I recommend that the otologist be consulted during the patient's health for the detection of commencing changes in the ears. These organs are then amenable to treatment, and thus can the later chronic, deplorable conditions be avoided. The ears should be tested to determine the hearing distance and range. This should be done whenever there has been any severe constitutional disturbance, or when there has been an affection of the upper air tract. The ears should be tested at intervals of a year or two according to the age of the patient.

CONCLUSIONS.

Periodical examinations of the ears should be made and functional tests applied at all ages and after any general disease or affection of the upper air tract, inasmuch as serious damage to the ears may take place without the knowledge of the patient. When the individual is aware of the impairment, the pathological changes have advanced far enough to render recovery difficult. The early detection of aural disturbances allows adequate treatment, with the expectation of the prevention of aural vertigo, tinnitus, deafness, intracranial lesions from middle ear suppuration, and the dangers of systemic infection.

XXXVI.

THE PHYSICAL EXAMINATION OF CLEVELAND SCHOOL CHILDREN*.

BY GEORGE W. EHLER, C. E.

CLEVELAND.

SUPERVISOR OF PHYSICAL TRAINING, HYGIENE AND SCHOOL
SANITATION.

The purpose of this paper is strictly information. There is no need that before this body one should discuss the question as to whether school children should be subjected to thorough medical and physical examination. It is taken for granted that all here are agreed upon the general proposition. There might be room for discussion upon the scope, the methods and the means of such examinations, but the paper will confine itself to a statement of what has been done in this direction, what is being attempted at the present time, and what is proposed for the future.

Cleveland was among the first cities in the country to introduce an examination of the vision and hearing of school children. This practice was begun several years ago under the direction of Dr. L. K. Baker, at that time Supervisor of Physical Training. The tests for acuity of vision and of hearing were conducted by the regular grade teachers, using the Snellen's card for the former and the Gale test for the latter. Record was also made of the appearance of the eyes and lids, of strabismus, pain or aching of eyes or head or ears, and of the presence of pus or odors from the ears.

Reports of all children having symptoms under any of these items were submitted to the supervisor and notices were sent by the teachers to parents. Children whose parents failed to take measures to relieve children found defective, or whose parents were too poor to secure proper medical service, were examined by the supervisor, eyes being refracted in large numbers of cases and treatment prescribed. An annual re-examination was made of those who previously had been

found defective, and every four years an examination was made of all pupils above the first grade. Many children of indigent families were aided, some by money subscribed to pay for glasses, and others by the Municipal Department of Charities.

In 1904 this work came under the direction of the present administration. An examination of all children above the first grade was ordered, and the results were tabulated. The percentage of children reported with one or both eyes defective varied from eight to thirty-three per cent of the total number in different schools. Some of the lowest percentages were reported from badly lighted buildings and from schools attended by children of poor families. Rooms of the same grade in the same buildings reported percentages varying from 2 to 80. These percentages led to suspicion of the reliability of the examination. And when a study is made of the conditions under which the examination was conducted it is readily seen that its value is very questionable as least in regard to vision, and yet it is a method quite generally followed, and the latest law on this subject passed last fall by the legislature of Massachusetts, prescribes that such examinations shall be done by the regular grade teachers.

The method has the advantage of economy and it is conceivable that its disadvantages might be largely overcome, but it seems rather doubtful. Teachers consider it another burden, they have little or no training for it, it must be done in the school room, either before or after school, at recess or the noon intermission. It should be done with no other child present. This precludes during the period of the examination all scholastic help to other pupils. To save time, several children are usually in the room at the same time. This tends to invalidate the visual test. Then in some places it is quite the thing not to be able to read the test type. One principal tells of an experience in this connection. A teacher reported every child in the room defective in vision. The principal was suspicious. She called the pupils to her room separately, no communication being permitted between them in the meantime. She found only a small percentage defective. This is sufficient to indicate the possibilities of error.

It was planned to make a re-examination in 1905 for the purposes of comparison but a petition of the principals that the teachers be relieved of the work led to its being dropped

and plans were laid to have it done by the physical training teachers. During the fall of 1906 this plan was put into operation. The special teachers of the physical training are all persons, with the exception of one or two, who have graduated from modern normal schools of physical education and are therefore quite well qualified to do at least what has heretofore not been thought too difficult for the grade teachers. They are all students of physiology and hygiene and the principles of physical training and therefore conversant with the functions of the chief organs and of their hygiene and of their usual defects. They should therefore have a reasonable degree of ability to determine, within certain limits, whether the eyes, the ears, the teeth and the nose are in a normal state.

Under these circumstances it was determined to broaden the scope of the examination somewhat, for the purpose of presenting an object lesson to the Board of Education and to the community, that might serve to secure the establishment of a really comprehensive and thorough physical and medical examination and such administration of the same as would, we believe, produce results commensurate with the need.

A card record was planned for each child from the second to the seventh grade inclusive. Each card included the following items: Name, date of birth, date of examination, school, grade, scholarship; under heading Eyes—R. vision, L. vision, strabismus, inflammation, ache (of eyes or head) and fatigue; under Ears—R. hearing, L. hearing, ache, pus and odor; under Nose—nasal obstruction, and mouth breathing; under Teeth—dirty, defective. A vertical ruling into columns provided space for re-examinations.

The first group of items was to be filled out by the grade teacher. Scholarship was to be entered on a scale of four: 1 for very good; 2, good; 3, fair. 4, poor. Vision is tested for acuity alone, using the usual Snellen chart at twenty feet. The number of lines above the unit line not read are noted. Tests for hyperopia were discussed, but it was decided to omit them until the examiners had acquired a year's experience. Moreover, there was considerable doubt expressed as to the value of any such test under the circumstances.

Under inflammation was comprehended any indication of soreness of eye or lid. Careful inquiry is made as to any history of aching eyes, frequent frontal or other headaches, and fatigue after reading or study, and record is made of any

noticeable deviations. Children wearing glasses are examined with the glasses in place and the use of them is noted.

Owing to the time required, second grade children were omitted later. It was found that many of them when asked to read the card, began to repeat the alphabet, and much time was consumed in making them understand what was wanted. I am under the impression that the frequency of this experience has a rather important significance of a scholastic nature, but there has been no opportunity as yet to investigate it.

In the examination of the hearing, children are required to repeat letters, words and numbers whispered at a distance of fifteen feet, one ear being closed. This is not very satisfactory. Many of the school buildings are located on street car lines and the noise incident thereto renders this test impossible except with great waste of time. The lack of a suitable room in many buildings renders this test nearly valueless. We shall attach very little significance to this item for statistical purposes. The presence of pus or odor is readily discerned.

Nasal obstruction is always noted whenever difficulty of free breathing through either nostril is noted, the lips and the other nostril being closed. Mouth breathing and the presence of unclean or bad teeth are readily detected by observation.

The examination completed, the card is returned to the teacher who notes in her register any item checked. She then sends to the parent or guardian a formal notice indicating the organs that are apparently defective. This notice urges immediate consultation with a physician and offers to give necessary information if needed in order to secure medical service. It is printed in six different languages—English, German, Italian, Bohemian, Hungarian and Polish.

After a reasonable time has expired, if nothing has been done for the child, a personal note is sent and an interview solicited and every effort is made to secure some definite action. Large numbers are glad to have their attention thus directed, many ignore it (either considering it of no importance, or denying its accuracy, or, being poor, feel that they cannot afford to do anything), others object to their children wearing glasses for instance or are afraid of an operation, or for other reasons refuse to have anything done. Still others violently resent the examination. This last group is quite insignificant in numbers but is not confined to any special class of the public.

Where parents are recalcitrant, and the condition of the child is serious, every possible influence is brought to bear, and when everything else fails, a recourse to the juvenile court is threatened. This always works. The court has authorized us to call upon it for a subpoena on the charge of "neglect" in all such cases. We have never had to have one issued.

Every effort is made to secure the right kind of assistance for those who are poor. Pauperization must be carefully guarded against. We have on the one hand a considerable number able to pay reasonable charges but ever ready to get something for nothing. On the other hand, a numerous group unable to pay ordinary charges but who do not want to become objects of charity. Between these is another group unable to pay and willing to continue in that state. The Associated Charities render excellent service in this connection and this is capable of great development. Parents are referred to the dispensaries and clinics only when they state, or it is discovered, that free service is a necessity. A number of oculists, aurists and other specialists and general practitioners have offered their services free and at reduced rates for cases which it does not seem desirable to send to the clinics or dispensaries.

In the matter of spectacles, the Board of Education has a contract with a reputable prescriptive optician whereby glasses are supplied at a very low rate and subject to the approval of the prescribing oculist. Children of indigent parents are sent to the Municipal Department of Charities and are supplied at the city's expense. During the last three or four months about forty children have been supplied through these two agencies. The city has also established a free dental clinic, where principals can make regular appointments for deserving children.

The examiner is in a building from two or three days to ten days or two weeks, depending on the size of the building. They are able to handle from one hundred to one hundred and fifty children in a day of five hours. During this time they take up with the teachers and principal and parents the more serious cases and press for immediate action, and are able to accomplish large results. Many cases of children, whose eyes are found defective, report that they have glasses but do not wear them. All such are excluded until they bring their glasses and wear them, and are sent back when they

forget them. Again they find many who have a desire to wear glasses and who try to secure a report of defectiveness. The personal education the examiners are able to give in relation to these and other matters, such as cleansing the teeth, has a force, under these circumstances that can hardly be overestimated.

No statistics have as yet been compiled showing the conditions found or the results that have already accrued. We know, however, that the number of children wearing glasses has been increased by the hundred (I would almost say thousand), and hundreds have been treated for ear, nose and throat defects, as a direct result of these examinations.

During the fall we had the services of a special teacher who is a physician. He was detailed to the work of examining children reported mentally defective, epileptics, the deaf and the more serious cases of other defects. His report on leaving our city in December gives a slight indication of the definite results being secured under this confessedly unsatisfactory plan. (It must be remembered that all supervision of physical training, plays and games and inspection of ventilation, etc., was dropped entirely throughout this school year, except for the month of January, in order that this examination might be conducted.)

Dr. Fischer, now the Supervisor of Physical Training and School Hygiene of Indianapolis, reported as follows:

"In reporting bad eye, ear, nose and throat conditions to the parents, and insisting upon their being treated and improved, many interesting letters were received, and not a few stormy interviews held. Such a statement as 'Mind your own business, I'll take care of my children to suit myself,' was putting it mildly. In all cases, I maintained my position, and with the aid of the Truancy Department, the Juvenile Court, the Associated Charities, the various hospitals and physicians, I forced parents to do the proper thing to better the child's condition physically and mentally. Before beginning the work, I fortified myself with plenty of help. I put myself in communication with all the hospitals of the city, and asked them to give the children, sent by us, special care. Knowing the objections many people had to going to a hospital dispensary, I secured the services of six of our best specialists, all of whom promised to care for these children, free of charge, where the parents were unable to pay. In this way many bad

cases of eye trouble were attended to, sixteen cases of adenoids were operated on privately, and thirteen cases of ear suppuration and partial deafness are being treated at the present time."

* * * * *

"The greatest opposition was encountered when I began to insist that the children afflicted with epilepsy be sent to the special school established by the Board. I kept at it, and today all epileptics are either at Brownell School or have gone to institutions where such cases are cared for. With the aid of Assistant Superintendent Muckley, I was enabled to send the bad cases of deafness to the deaf school. Several boys, who were habitual smokers and morally defective, were sent to the Boys' School."

* * * * *

"In all, I visited seventy buildings, some of them several times. 308 children were reported defective. Of this number I examined 288, 74 being sent to the defective grades; 21 are still upon the waiting list because there is no room for them. This does not include the 19 children in the Broadway district. Eight cases of epilepsy were sent to the special grade at Brownell School, and 4 cases of deafness to the Deaf School. Nineteen cases of ear disease, 107 eye, and 127 nose and throat cases were examined and referred either to hospitals or private physicians for correction. The cases that I have reported are *only the bad ones*, and a *small percentage of those that really need looking after*. The other special teachers are also doing good work along these lines. I examined several cases of spinal curvature, and would suggest that next year more attention be placed upon the detection of these cases."

The Board of Education of Cleveland maintains ten classes for mental defectives, established since January, 1905, and serving upwards of 150 children, a school for the deaf with about fifty pupils, and a class for epileptics with eight pupils. Under the school code of Ohio, the Board has the authority to assign a pupil to such a class or school as, in its opinion, will best serve the educational interests of the school district. It is also empowered to employ such persons for the conduct of the schools as in its judgment are necessary. It also has power to levy its own taxes without review, up to the limit established by the state, and in addition to issue bonds up to

two per cent of the tax duplicate for certain purposes without popular vote, and for additional amounts subject to a referendum. Under these conditions it is believed that Cleveland has an opportunity to do the best things for its children above any other city. That the Board of Education is alive to this opportunity is evidenced by many things but by none more than the appointment of its President to serve with the President of the Board of Health and the Chairman of the Chamber of Commerce Committee on School Sanitation as a committee to work out a comprehensive and scientific plan and method for a Department of School Hygiene. This committee has appointed a sub-committee consisting of a physician from the Sanitation Committee of the Chamber of Commerce, a physician of the Board of Health, and the Supervisor of School Hygiene, the functions of which sub-committee are to define the problem and work out a tentative solution of the same. Members of the Board of Education have already expressed themselves as favoring a solution on a modern and scientific basis.

The following outline plan for a Department of School Hygiene, and its relation to the Board of Health, has been favorably considered:

A DEPARTMENT OF SCHOOL HYGIENE.

Four kinds of work to be done:

1. Prevention of communicable diseases.
2. Care of children physically and mentally defective.
3. Maintenance of a good hygienic environment.
4. Constructive measures—included under the general term "Physical Training" (Motor Education, Play as an Educative Factor, Development of Organic Power and Endurance, Increase of Vitality, Securing Good Posture, etc., etc.)

No. 1. Belongs exclusively to Board of Health.

No. 4. Belongs exclusively to Department of Hygiene and Physical Training.

No. 2. (A) Involves, primarily, the discovery of children requiring care.

(a) Mental defectives—(backwards, etc.).

(b) Physical Defectives—(1) eye, ear, nose, throat, teeth, cripples, etc., and (2) epileptics, choreics, anemics, etc.

(B) Their care involves—

(a) The separation of certain groups from the regular classes—mental defectives, the deaf, crippled, epileptics and blind, and the direct supervision of their attendance in school.

(b) The selection of cases, concerning some of whom only a recommendation of special medical or surgical care would be made to their parents, and of others for whom, under proper safeguards, such attention should be required. This involves the

(1) Co-operation of examiner, principal, teacher and parents;

(2) Following up and conferring with parents and family physician;

(3) Establishing relations with dispensaries, clinics, etc., and securing their services in all proper cases;

(4) Relationships with Associated Charities, the Juvenile Court and State Institutions; and

(5) Following all such cases throughout their school life.

This whole problem is so intimately bound up with all the school processes that it should be under the immediate direction and supervision of the Department of School Hygiene of the Board of Education.

It might be desirable to make the Director of the Department of School Hygiene a deputy of the Health Officer in order to establish a direct official relationship between the two Boards.

The appointment of a corps of School Physicians (12 to 15), by the Board of Education, in co-operation with the Special Teachers of Physical Training would handle all matters arising in No. 2 and No. 4. This would necessitate a clear definition of the work to be done by each Board so as to avoid unnecessary duplication. A medical assistant in the Department of Hygiene and Physical Training in this connection is absolutely essential whatever plan is adopted.

No. 3. The maintenance of a good hygienic environment includes:

(a) The establishment of hygienic standards;

(b) The detection and correction of present unhygienic conditions of lighting, heating, ventilating, sanitation, seating, cleaning, etc.;

(c) The supervision of the hygienic aspects of all new buildings, involving relations to architect, building committee, director and superintendent; and

(d) Supervision of the hygienic aspects of the school processes.

This aspect of the problem involves the legal power of the Board of Health to establish minimum "standards" and to require their maintenance. It involves the duty of the Board of Education to secure the maximum of quality and efficiency consistent with social economy.

The bare statement of this whole problem indicates the necessity of correlation of the two Boards in regard to it, and the arrangement suggested above might be the solution. There are many practical difficulties, but they are not insurmountable.

TUBERCULOSIS OF THE MIDDLE EAR IN CHILDREN, WITH SPECIAL REFERENCE TO ITS OCCURRENCE AS A PRIMARY LESION.*

BY PAUL MATHEWS, M. D.

There are numerous considerations which combine to render tuberculosis of the middle ear and temporal bone a subject of great interest and importance, both clinically and pathologically. The number and variety of the channels through which infection may take place, the frequency of the condition, its occurrence in infants, the gravity of the condition and of its possible complications, the multiplicity and diversity of its signs and symptoms, the urgent necessity for drastic treatment, the possibility of absolute diagnosis and ultimate cure are the most important of these considerations.

Important as the subject undoubtedly is, it is only recently that much attention has been paid to it, and even now its frequency and gravity are not duly appreciated, nor are its signs and symptoms sufficiently detailed in the current text-books. Indeed, many of them (even of those dealing exclusively with diseases of the ear) pass it by altogether or treat it with a brevity it ill deserves.

Before discussing the question in detail, it is desirable that it should be understood that in the following paper the term "middle ear" will be held to include, not only the cavum tympani, but also the mastoid antrum and Eustachian tube. This is fully warranted by the anatomy and the developmental history of these cavities, as has been insisted upon by Young and Milligan (1). Owing to the difficulties in determining the primary site of the tuberculous process in these parts, it is convenient to consider tuberculosis of the middle ear together with tuberculosis of the temporal bone; for it is rare that cases of the former come under our notice before there is some involvement of the bone, and still less frequently do we encounter tuberculous caries of the temporal bone before the middle

*From the British Journal of Children's Diseases, Oct. and Nov., 1906.

ear has become affected, except in cases where a temporal caries—unsuspected during life—is revealed upon the post-mortem table. That the two conditions can, and do, arise separately scarcely permits of doubt, but it is inconvenient for purposes of practical diagnosis and treatment to disassociate the two conditions.

Although the condition does not yet receive full recognition of its importance, its occurrence has been recognized for many years. The association of chronic otorrhea with the scrofulous or strumous diathesis did not escape the observation of the physicians and surgeons of the early part of last century, and was insisted upon when the diseases of the ear became the subject of special study. In the absence of the evidence which we now regard as a *sine qua non* in the verification of the diagnosis of the condition, it is necessary that the cases described by early writers, and the conclusions they draw from them, should be accepted with considerable reserve. In discussing chronic otorrhea Wilde (2) states that in children it is to be regarded as indicative of the strumous taint, and notes its frequent association with scrofulous glands in the neck. He records many cases of chronic otitis media and caries of the temporal bone in association with lesions elsewhere of which we cannot doubt the tuberculous nature. There is obviously no reason why a patient suffering from a localized tuberculosis (*e. g.*, of the ankle or lung) should not also suffer from a non-tuberculous otitis media, and we must therefore be cautious, in the absence of conclusive evidence of the nature of the middle ear condition, in accepting such cases as examples of middle ear tuberculosis. Wilde gives notes, however, of a case which scarcely permits of doubt as to its tuberculous nature, viz. that of a child of nine, who for several years suffered from morbus coxæ, and in whom facial paralysis, preceded by chronic otorrhea, developed first on one side and then on the other, death finally supervening from "cerebral disease" (tuberculous meningitis?). Wilde also refers to the occurrence of otitis media in phthisis, and suggests that infection spreads *via* the Eustachian tubes. He draws attention to the painless character of the condition, a point of some diagnostic importance.

Tonybee (3) clearly associates many cases of chronic otitis media with tuberculosis. He gives notes of many cases in which "scrofulous matter" was found in the tympanic cavity,

but in most cases his notes are insufficient for our purpose. The following may, however, be accepted as genuine cases of tuberculosis of the middle ear or temporal bone:

1. A boy aged 4 years. Post-mortem examination revealed tuberculous meningitis, with a tuberculous deposit in the cerebrum. The tympanic cavity contained "scrofulous material."

2. A girl aged 1½ years. Post-mortem showed tuberculosis of the lungs and mesenteric glands. The temporal bone was carious; there had been otorrhea for seven months.

3. A girl aged 15 years. Post-mortem revealed tuberculosis of the lungs. The middle ear and mastoid were "scrofulous," and there was caries of the temporal bone. In life patient had had facial paralysis.

4. A man aged 44 years died from phthisis. Post-mortem revealed caries of the petrous temporal. In life he had otorrhea and partial facial paralysis.

He also mentions two cases in infants, aged 1 year and 4 months and 11 months, in whom there was long-standing otorrhea and "scrofulous glands in the neck." The condition of the viscera is not mentioned in the post-mortem notes of these two cases.

Other references to the condition are found in the writings of Nelaton, Rokitsansky, and others.

From what precedes it will be seen that the condition was recognized many years ago, and many of the recorded cases, in spite of the absence of the conclusive evidence afforded by the detection of the tubercle bacillus, may be regarded as authentic.

The discovery of the bacillus tuberculosis by Koch in 1882 placed in our hands a means of diagnosing the condition with certainty. The bacillus was demonstrated in the aural discharge by Eschle (4) in 1883, and subsequently Nathan (5), and more recently Grimmer (6), Wingrave (8), Milligan (7), and others have demonstrated the frequency of its occurrence. The literature on the subject has grown apace, numerous cases have been recorded and analyzed, and the symptoms, etiology, and pathology have been elaborated by many observers.

In discussing the association of tuberculous otitis media with late phthisis, Wilde (2) suggested that the Eustachian tube was the avenue of infection of the tympanic cavity. This has largely been accepted as probable by subsequent observers; but

the occurrence of cases in which no pulmonary tuberculosis exists, and of cases in which the tuberculous process is confined to the temporal bone, point to the possibility of other channels of infection, and suggest that the tuberculous lesion in the middle ear may in some cases be primary, and not secondary to tuberculosis elsewhere. Many cases of primary tuberculosis of the middle ear or temporal bone have been recorded by Knapp (9), Goldstein (10), Williams (11), McCaw (12), Oppikofer (13), Jobson Horne (14), Hurd (15), and others. It is not intended to detail or to analyze these cases here; and the following cases are quoted briefly to indicate the nature of the condition of which they are typical.

1. Case recorded by Jobson Horne (14), a child aged 1½ years. History of wasting for seven months, with otorrhea for four months and cough for three months. When seen had had facial paralysis, otorrhea, and swelling behind ear due to subperiosteal abscess, which was incised, necrosed bone being found. The aural discharge contained tubercle bacilli. Death subsequently ensued from miliary tuberculosis.

2. Case reported by Hurd (15), child aged 1 year and 5 months. A swelling over the mastoid was lanced when patient was six months. The wound refused to heal, and later necrosis of the bone ensued. Microscopic examination of the granulation tissue showed evidence of tuberculosis. The child showed no signs of tuberculosis elsewhere.

3. Case reported by Knapp (9), child aged 5 years. Patient had tuberculosis of bone in the back, ankle, above right eye and below left eye. There was a granulating ulcer behind the right ear leading down to carious bone. There was no sign of disease of the external meatus or of the cavum tympani, the mastoid alone being affected.

4. Case reported by Oppikofer (13), child aged 6 months. Discharge from ear following measles. Patient had facial paralysis; the antrum contained pus; granulations from the caverna tympani showed tuberculous changes. Death occurred seven months later from general tuberculosis, the lungs, larynx, and meninges being affected.

An interesting case is recorded by Freysing (52), in which there were multiple tuberculous tumors on the skull, together with involvement of both tympanic membranes.

ETIOLOGY.

That the condition should occur not infrequently in late phthisis need not surprise us when we recollect the channels of infection. It is difficult, however, to estimate its frequency, and the published statistics differ widely. Thus Schwabach (16) found aural suppuration in eight cases out of 139 patients suffering from pulmonary tuberculosis. Moldenhauer (17) found seven cases of middle-ear suppuration in 294 cases of tuberculosis (pulmonary and otherwise). Carr (18) in 120 post-mortem examinations on children dying of tuberculosis found the middle ear and temporal bone tuberculous in three cases. Price-Jones (53) in twenty-one cases of tuberculosis in children (examined post-mortem) found it in two cases. Still higher figures have been published. Thus Still (19) in the post-mortem examination of 269 tuberculous children found the middle ear tuberculous in fifteen, and of these he regarded the aural condition as primary in no less than nine. In a series of twenty-five post-mortem examinations of tuberculous subjects at the Newcastle Sick Children's Hospital, the writer (44) found evidence of the condition in the middle ear or temporal bone in seven cases, in two of which it was unsuspected during life.

Whilst it has been shown that middle-ear tuberculosis is more frequently a complication of phthisis with cavitation than of any other form of pulmonary tuberculosis, it is also a well-established fact that in children cavitation occurs with much less frequency than in adults; indeed, it rarely occurs in patients under seven, and in infancy is almost a pathologic curiosity. Under these circumstances we should expect to find tuberculosis of the middle ear less frequent in infancy than in adult life were its occurrence dependent on infection from pulmonary tuberculosis. The very reverse, however, is the case. Tuberculosis of the middle ear occurs more frequently during infancy than in any other period of life. Indeed, after the third or fourth year its frequency undergoes marked diminution, and except as a complication of late phthisis it is subsequently a rare affection. Its frequency in infancy is well shown by Whitehead (22), who analyzing 100 consecutive fatal cases of middle-ear disease, found that 12 were cases of tuberculosis of the middle ear, and of these no less than nine occurred in children under two years of age, and in eight of these the aural condition appeared to be primary.

It has been maintained by Horne, Grimmer, and Milligan that the condition is not infrequently primary in infants, an hypothesis well sustained by the figures quoted above. It has been stated by Milligan (21), that of his hospital patients under six years of age suffering from suppurative otitis media, between 50 and 60 per cent. suffer from tuberculosis of the middle ear.

The fact that the tympanic condition may be primary must not be overlooked in considering the etiology of the condition.

Tuberculosis in infants and children is, unfortunately, only too frequent, and it has largely been ascribed to invasion through the lymphatics of the alimentary tract, from which the milk of tuberculous cows has largely been assumed to be the vehicle of infection. It is even asserted by Nathan Raw (54) that this is the almost invariable mode of invasion in infants. It must not be forgotten, however, that so far as bacteriology is concerned the middle ear is to be regarded as a portion of the upper respiratory tract, as has been emphasized by Goldstein (10) and others. If tuberculosis of the middle ear, then, is primary it must be regarded as a case of "respiratory" rather than "alimentary" tuberculosis. The fact that the patients are most frequently infants, and that they are derived from a class who are not largely fed on cow's milk, lends support to the view that infection is *via* the upper respiratory rather than the alimentary tract. It has been pointed out by Milligan that the condition is much more frequent in hospital patients than in children of the upper classes. No doubt unhygienic conditions and overcrowding are important factors, nor must we overlook the importance of the presence of tuberculosis in other members of the family, with whom patient may be in constant contact. Of our own series six had a family history of tuberculosis. As regards the infection from cow's milk, it is interesting to know that of the five cases under one year of age three were breast-fed entirely until admission to hospital, and one had been fed entirely on patent foods.

The occurrence of the condition in cases of tuberculosis involving organs has been studied by many observers. It is stated to occur with greatest frequency late in phthisis, when the sputum is most abundant and most likely to remain near the pharyngeal openings of the Eustachian tubes, owing to

the diminution of the patient's expectorating power—*i. e.*, when the chances of infection via the Eustachian tubes are at a maximum. Politzer (23) has shown that infection may arise during the last few days of life. It may, indeed, be merely a part of a general tuberculosis which closes the scene. Brieger (24) and Milligan (21) state that the middle ear is more liable to be infected secondarily to pulmonary tuberculosis than to tuberculosis elsewhere.

CHANNELS OF INFECTION.

To produce tuberculous lesions in the middle ear or temporal bone it is necessary for the bacillus to gain access to these parts, and this it may do by one or other of several channels, which are:

1. By the air passing up the Eustachian tubes and mechanically conveying the bacilli to some part of the middle ear.
2. By infection spreading up to the cavum or antrum via the Eustachian mucosa.
3. By infection spreading via the lymphatics from lesions elsewhere.
4. By infection carried by the blood-stream from tuberculous lesions elsewhere.
5. By infection from the external ear.

The first-named method may at first sight appear improbable. We cannot, however, dismiss it without first duly considering the factors which may influence its occurrence.

The general anatomy of the Eustachian tube is so well known that it is unnecessary to enter into its details here. Certain facts, however, may profitably be reviewed in order that we may fully appreciate the possibilities of this line of infection. In the adult the tube is from 34 to 36 mm. in length, but in children it is much shorter, being, indeed, in the newborn infant less than 20 mm. in length. Its width is comparatively (and it is even stated by Eitelberg actually) greater than in adults. Hence any object lodging in the tube is more liable to be removed by currents of air in children than in adults. In children, too, the tympanic orifice lies lower, and is comparatively larger than in adults, and the pharyngeal orifice much nearer to the choanae, and therefore to the currents of air by which air-borne bacilli may enter. It has been shown by Young and Milligan (1) that smoke insufflated

into the Eustachian tube passes directly through the cavum tympani into the antrum, and that air-borne bacilli may similarly gain entrance to the antrum is by no means inconceivable. It is true that the bacilli will in the majority of cases tend to alight on the Eustachian mucosa and be removed from thence by the cilia lining it, but in the short, wide tube of infants the possibility of the bacilli being driven beyond the tympanic orifice by the strong blasts of air produced by efforts such as sneezing, coughing, etc., is greater.

Even in adults particles much larger than bacilli may thus gain entrance, as is proved by the case reported by Haug (25), in which particles of snuff gained access to the cavum by this method, and there set up a purulent otitis media. Similarly, it is not impossible that minute particles of food may be mechanically insufflated into the tympanic cavity by the act of choking or vomiting, and thus convey the bacilli into the cavity of the middle ear. It has been suggested by Milligan (26) that the movements of sucking initiate currents of air along the Eustachian tubes, and thus help to account for the frequency of the condition in infancy.

In the production of the condition in late phthisis this method again appears probable. In the wasted condition of advanced pulmonary tuberculosis, the tissues surrounding the tubes are shrunken and atrophied, and the lumen of the tube becomes wider than in health—Haberman (27). It has been shown by Jobson Horne that aural tuberculosis is much more frequent as a complication of pulmonary tuberculosis when there is cavitation than when the pulmonary lesions are miliary in type. The frequent coughing and the abundant sputum also render it likely that particles of sputum laden with bacilli may be driven through the tube into the cavum tympani. It is at least suggestive that the condition should be so frequent in late phthisis and in early childhood, when the conditions favoring this mode of infection are at their maximum.

The second method, viz., *invasion by spreading of the tuberculous processes along the Eustachian tube*, is subject to the same conditions as the first, and would appear to be of more frequent occurrence. The two methods are so closely connected that we cannot entirely dissociate them. It is important to remember that the middle ear should be regarded as a part of the upper respiratory tract, as has been insisted upon by Jobson Horne (28) and Goldstein (10). The latter

states that "over 70 per cent. of the inflammatory and infectious processes which involve the ear have their origin in the pharyngeal and naso-pharyngeal cavities." Politzer also regards this line of invasion as the most frequent.

While tubercle bacilli driven into the tympanic cavity tend to remain there, there is a greater probability of them being removed from the Eustachian tube by the ciliary movement should they chance to alight on the Eustachian mucosa. Hence it follows that while there is a greater possibility of bacilli gaining access to the Eustachian mucosa, there is also a greater probability of them being removed before inciting tuberculous changes. It is possible, however, that under favorable circumstances the bacilli may pass through the mucosa, without producing in it any lesion, to the lymphoid follicles which have been seen and described by Gerlach in the mucosa lining the tubes in children.

The probability of tuberculosis originating in this manner is enhanced by the occurrence of catarrhal changes such as are frequently produced in the exanthemata, etc. Politzer (23) has frequently seen tuberculosis of the middle ear, associated with enlargement of the cervical glands, following on an attack of scarlet fever.

In addition to the exposure of the orifices of the tubes to the inspired air, whereby air-borne bacilli may reach the Eustachian tubes, there is also danger of infection of the tubes by spread of tuberculosis from adjacent structures. Primary tuberculosis of the nose and of the pharynx are both rare except as complications of late phthisis, and the chances of infection from these areas appear to be remote; we must not forget, however, that the presence of excessive adenoid tissue in close proximity to the openings of the tubes introduces another factor of considerable importance.

The frequency with which "adenoids" are subject to tuberculosis has been variously stated by different authors. Thus McBride and Turner, examining adenoids removed from 100 patients, found evidence of tuberculosis in only three cases (a figure which they admit is probable an underestimate). Pilliet (30) found tuberculosis in three cases out of forty (7.5 per cent.). Dieulafoy (31) in thirty-five cases found tuberculosis in seven (20 per cent.). Brindel (32) found evidence of tuberculosis in eight cases out of sixty-four (12.5 per cent.); Gottstein (33) in four cases out of thirty-three (12 per cent.):

Pflüder and Fischer (34) in five cases out of thirty-two (15.6 per cent.); Milligan (35) found it in 16 per cent., as also did Lartigan and Nicol (61). To obtain the above estimate, histologic and inoculation methods were employed. It is interesting to note that the most exact method—inoculation—gave the highest figure (Dieulafoy, 20 per cent.). It will be seen that “adenoids” are by no means infrequently the seat of tuberculous changes, and their presence may be an important factor in producing tuberculosis of the middle ear.

The third method of infection, viz. *via the lymph-current* from the glands, can occur only by extension against the lymph-stream from the glands through which the lymphatics of this area pass. Such extension has been shown to occur elsewhere, and we must accept its possibility in this case. Unfortunately, the lymphatics of this area are not well determined, and our knowledge of their anatomy is very imperfect. Poirier and Cuneo (36) affirm that the lymphatics of the cavum tympani originate in a network from which branches run to the retropharyngeal glands, which also receive afferents from the Eustachian tube. These glands are two in number on each side, and lie behind the pharynx, in front of the lateral masses of the atlas. In addition to draining the middle ear, these glands receive afferents from the pharynx (in its upper part), and from the nasal fossae. Efferents run to the superior cervical glands lying alongside the internal jugular vein. It will be seen that these glands drain an area which is much exposed to bacterial invasion. When we recollect the frequency of posterior rhinitis, pharyngitis, and Eustachian catarrh occurring in the exanthemata, or as part of ordinary “colds,” we are not surprised at the occurrence of inflammation of these glands. Clinically, however, we find that this rarely occurs except in infants and young children, and it is even stated that these glands undergo spontaneous atrophy towards the close of the third year (62). Prior to this, suppuration in them not infrequently occurs, and is the most frequent cause at this age of retropharyngeal abscess.

The wide area drained through these glands renders it difficult for us to appreciate the frequency with which Eustachian and tympanic infections are the cause of their enlargement. We must not forget, however, the possibility of the middle ear and its adnexa being infected secondarily to tuberculosis of these glands, the original seat of invasion possibly lying in the nasal or pharyngeal mucosa.

The association of tuberculosis of the middle ear with lesions of these glands is suggested by the age-incidence of the two conditions.

Clinically, tuberculosis of the middle ear is often associated with enlargement of the lymph-glands lying over the mastoid process and also with those in the superior cervical chains. Indeed, early involvement of these glands in the course of chronic otitis media has been held by Grimmer, Milligan, and others to be indicative of the tuberculous nature of the middle ear conditions.

Infection through the blood-stream from a focus more or less remote is of the utmost importance. Barnich (37) has shown that this method occurs most frequently when the lesion from which infection takes place is situated in some part of the osseous or glandular system. It is precisely these two forms of tuberculosis which are most frequent at the age at which tuberculosis of the middle ear most frequently occurs. Such a mode of extension implies that the condition may not of necessity begin in the tympanic mucosa itself. In fact, cases originating in this manner in all probability usually arise as an osteomyelitis of the pars mastoidea or pars petrosa of the temporal bone, and involve the middle ear by extension. Such a method would fully explain the occurrence of cases in which the pars mastoidea is extensively affected while the tympanic cavity remains unaffected, though such cases may conceivably arise through the infection of the antrum through the Eustachian tube.

There are many phenomena associated with the condition which favor this mode of origin. The age-incidence is important, for it is undoubted that blood-infections are more frequent in childhood and infancy than later in life, as also are tuberculous affections of the bones. It can be shown that not only is tuberculosis of the osseous system more frequent in early life, but also that certain bones are more frequently affected at certain ages than at others. Thus dactylitis is most frequent during the first three years of life. During a year at the Newcastle Sick Children's Hospital, fifteen cases of spinal caries were admitted for treatment. In twelve of these cases the caries affected the lower cervical or upper dorsal spine, and all these patients were between two and five years of age. The other three patients were older and in them the caries affected the lower dorsal or lumbar spine. To generalize

on such small numbers would be to court fallacy, but these figures were supported by the out-patient statistics. Without pressing the point too far, it may be possible that the occurrence of such a large majority of so-called "primary" cases of tuberculosis of the mastoid in the first and second years of life may depend upon, or be associated with, a similar predilection.

In this connection it may be mentioned that the stapes is more frequently affected in tuberculous than in any other form of middle-ear inflammation. The ossicle develops round the stapelial artery, which, usually atrophies and disappears towards the close of pregnancy; not infrequently, however, it persists some two or three years after birth, and may thus be the means of carrying blood-borne bacilli to the middle ear. In addition to the age-incidence the occurrence of extensive caries is of importance. Many cases when first observed show extensive caries of the temporal bone, a fact which might be ascribed to the absence of symptoms produced by the condition until by extension the tympanic cavity becomes infected. Milligan is of opinion that the osteomyelitis tends to remain as such until secondary septic processes arise in the cavum tympani or antrum. Cornet (38), on the other hand, thinks that caries of the temporal bone is generally secondary to infection of the tympanic cavity.

Associated with this early and extensive caries is facial paralysis, which may be the first indication of the condition.

That such a mode of infection exists permits of no doubt. The case reported by Knapp (9) is undoubtedly of this nature, as also in all probability the cases quoted above from Wilde (2) and Hurd (15). The occurrence of tuberculous deposits in this region in acute miliary tuberculosis has been observed, but it is of no practical importance.

The establishment of tuberculosis of the middle ear by *invasion from the external meatus* may occur, but is probably of rare occurrence. In cases where the drum has been perforated it is not impossible that the introduction of foreign bodies into the meatus may be the means of introducing bacilli into the middle ear.

Examination of these methods shows that each is possible. Practically the cases will tend to fall under one of two headings:

1. Cases in which the middle ear has been infected through the Eustachian tube or the air passing up it, such cases including those in which phthisis pre-exists, and also the true cases of primary tuberculosis of the middle ear. From what precedes it may be stated that the occurrence of the latter is greatly favored by the conditions which obtain in infancy, during which period such cases are more frequent than at any other period of life.

2. Cases in which the lesion is due to blood-infection, the mucosa of the middle ear or the temporal bone being the site of the lesion. Such cases include most of the so-called "primary tuberculous mastoiditis," etc. It has already been shown that such cases are most likely to occur in infancy owing to the increased frequency of bone-tuberculosis and of blood-infection during that period.

PATHOLOGY.

The tubercle bacilli, having gained access to the middle ear by any of the above routes, there give rise to the changes characteristic of tuberculosis. These changes have been described by Politzer, who examined histologically the mucosa lining the tympanum of a woman who died from phthisis complicated by otitis media. In this case the mucosa was largely destroyed and the bone extensively affected. Habermann (39) examined thirteen cases, and found all degrees of the condition from early infiltration down to extensive destruction of the temporal bone, and the researches of Barnich (37) and of Schwabach have extended our knowledge of the progress of the condition.

The changes induced differ somewhat according as the condition runs an acute or a chronic course. In the acute form there is rapid loss of tissue, consequent upon the ulceration of the tubercles, which are deposited in large numbers. This leads to perforation of the membrana and rapid formation of granulation-tissue. Occasionally the primary grey tubercles are visible on the membrana, in which situation they are not infrequently multiple, and Milligan (35) has been able to see them on the inner wall of the cavum through a semitransparent membrana. Although they so soon lead to perforation of the drum, they have been described by Politzer, prior to this, as pearly grey spots, with sharply-defined outline, and with little surrounding inflammation, though in some cases the whole

drum may assume a pink tint. As already stated, they rapidly lead to perforation, and if they are multiple they may by coalescence form a single perforation, or they may remain discrete. The occurrence of multiple perforations is a point of considerable diagnostic importance. Owing to the occurrence of perforation, and to other causes, it is usual for septic and putrefactive organisms to gain entrance and to speedily modify the pathologic processes.

While the acute form is a well-established entity, it is more usual for the condition to run a chronic course, and it is this chronic tuberculosis which presents the most typical picture. Owing to the intimate connection between the temporal bone and the tympanic mucosa—the deeper layers of which fulfil the functions of periosteum to the subjacent bone—the occurrence of tuberculous changes in the mucosa early leads to tuberculous infection of the bone, in which a cario-necrotic change is instituted. The process of the ulceration of the tubercles in the mucosa, leading to caries in the bone, has been fully described by Milligan. The caries progresses rapidly, and, as in tuberculous caries elsewhere, is not productive of much pain.

The reaction of the tissues excited by this chronic tuberculosis is not intense; and hence, instead of the hyperemic mucosa associated with an acute otitis, we find pale, ulcerated mucous membrane with profuse flabby granulations, which fill the cavum, and may even project through the perforated drum and form polypoidal masses in the external meatus. These granulations may show typical tuberculous changes, such as giant-cell formation, caseation, etc., as has been observed by Hurd and Milligan.

The caries extends steadily, and encounters no bar to its progress until dura mater or periosteum is reached. The dura is rarely perforated, but tends, as in Cases 2 and 10, to become thickened over the underlying caries.

The extension of the caries is of great importance in the production of complications, which may arise from implication of structures within the temporal bone. Thus the extension to the Fallopian aqueduct may cause facial paralysis, at first partial (from neuritis) and finally complete (from destruction of the seventh nerve). The production of this complication is favored in infancy by the incomplete ossification of the walls of the aqueduct, which do not offer so much resistance to the

disintegrating processes as they do when ossification is complete. Similarly, the labyrinth may be affected, and complete nerve-deafness, or—by involvement of the semicircular canals—persistent vertigo ensue.

Caries of the ossicles occurs with **considerable frequency**. In no other middle-ear condition are the ossicles so frequently destroyed. Caries of the foot of the stapes is considered by Haike (40) to be pathognomonic of tuberculosis. If this occurs the fenestra ovalis is soon destroyed, and the labyrinth thus becomes involved. Perforation of one or other of the fenestrae has been stated to occur in **33 per cent. of cases (35)**. Mention has already been made of the possibility of the stapes being principally infected in early infancy.

Although the bony changes are usually of the nature of a gradual disintegration, necrotic changes may occur and large sequestra be exfoliated, as in a case described by Goldstein (10).

In addition to the involvement of the nervous apparatus blood-vessels may be eroded and hemorrhage occur. Kössel (41) has described a case in which thrombosis of the lateral sinus was produced. A similar case (No. 6) is included in our series, but in this case there is reason to believe that the thrombosis was due to a septic organism rather than to the tubercle bacillus, though the latter was also present in the middle ear. Cheatle (55) has pointed out the importance of the petrosquamosal sinus as a channel of infection from the middle ear, and records a case in which miliary tuberculosis was so produced.

The occurrence of mastoiditis is not infrequent, and, as has been shown by Knapp, Hurd, Jobson Horne, and others, the antrum may be extensively affected before the cavum shows any signs of the condition. This appears more likely in such cases as the condition commences as an osteomyelitis of the pars mastoidea, but does not entirely depend on this mode of origin, as it has been shown by Young and Milligan that in cases of infection through the Eustachian tube mastoiditis may occur independently of inflammation of the cavum tympani.

Owing to the early perforation of the drum other organisms gain access and alter the course of the tuberculosis. Hence it is difficult to follow the later changes of the condition. The invasion of other organisms introduces a further difficulty in diagnosis, for the tubercle bacilli are apt to be disintegrated

and destroyed in the profuse discharge which is associated with the presence of putrefactive organisms. Hence the great difficulty in detecting the bacilli in stained films of the discharge in which they are never abundant, except in some acute cases.

The presence of tubercle bacilli in the middle ear soon leads to enlargement of the neighboring lymph-glands, in which the chronic inflammatory changes of tuberculosis—viz. formation of tubercles, giant-cell formation, and caseation—occur. These changes appear clinically to be usually first produced in the mastoid glands, from which subsequently the deep glands of the neck are infected. Glands in the parotid region may also be affected, as in Case 11, and the retropharyngeal glands are also liable to infection. In the present series they were enlarged sufficiently to cause symptoms in one case only (No. 3), but whether the glandular condition was secondary to the middle-ear condition in this case cannot be determined with certainty, for the tuberculous condition of the ear was only discovered post-mortem some months after the retropharyngeal glands became enlarged.

It is affirmed by Jobson Horne (42) that early glandular enlargement occurs in primary tuberculous conditions of the middle ear, but that the glands rarely become involved in cases where the condition of the ear is secondary to tuberculosis elsewhere.

Infection of the meninges is not infrequent as a complication which may ultimately cause death. Macewen (43) alludes to ten cases in which it occurred, in five of which the internal auditory meatus formed the line of infection. He has also found it produced by miliary tuberculosis, resulting from infection of the lateral sinus. Owing to the late union of the petrous and mastoid portions of the temporal bone, meningeal infection is more likely to occur in infancy than later. Not infrequently the meningeal condition is merely a part of a general miliary tuberculosis caused by blood-infection, to which infants during the second year of life are so prone. In the present series generally miliary tuberculosis was the cause of death in four cases (Nos. 1, 2, 3, 10), while meningitis only occurred in one (No. 5), in which case, unfortunately, permission for post-mortem examination was not obtained.

Mention is frequently made throughout the literature of this complication, and cases in which it has occurred are recorded

by Wilde, Milligan, Oppikofer, and numerous others. Horne states that this complication is not infrequent in cases of primary tuberculosis of the ear, but that its occurrence in cases where the tuberculosis of the middle ear is secondary is uncommon. On the other hand, it is affirmed by Politzer (23) that intracranial complications are less frequent in tuberculosis than in any other form of chronic middle-ear infection.

The occurrence of intracranial abscess is rarely seen. In the present series intracranial complications occurred in two cases only (Nos. 5, 6), in one of which there is reason to believe that this complication was associated with the presence of streptococci. Wingrave (56) has recorded an interesting case in which optic neuritis was produced.

The extension of the carious process in the other direction often leads to the formation of subperiosteal caseation and abscess formation. If the pars mastoidea be affected this may occur just over the antrum, or by extension inwards Bezold's perforation may ensue. On cutting down over the swelling in such cases, a fistulous track filled with unhealthy granulations and caseous *debris* and leading down to the antrum is found, as in Cases 1, 2, 3, 9 and 10. If left untreated these mastoid abscesses may burst through the skin, leaving a chronic indolent fistula, showing no signs of healing.

The fact that the Eustachian tube is shorter and wider in infants than in adults, and that the tympanic orifice lies lower and is of larger size, increases the probability of the thin, sanious discharge draining from the middle ear into the pharynx, from whence it may be swallowed and so convey bacilli to the lower alimentary tract. This may account for the frequency of the occurrence of enteritis as a complication, to which Milligan (57) has drawn attention. Such a condition would account for the frequency of diarrhea in these patients, though such a symptom may in many cases be due to general conditions rather than to local tuberculous inflammation.

While it will be seen that the complications which may occur are many, it is doubtful if the condition ever undergoes spontaneous cure. Politzer even casts doubt on the authenticity of cases reported as cured by operative interference. While it appears doubtful that cases occurring in late phthisis should be curable, it is not impossible that some primary cases may be cured by operation. It must be remembered that these cases occur at any stage when rapid and widespread dissemination of

tuberculosis occurs, and it is impossible in many cases to be certain that the aural condition is the only existing focus of infection. Indeed, owing to the slowness with which the condition declares itself, and the asthenic character of the inflammatory processes induced by it, it is probably infrequent that such cases come under observation before such dissemination has already occurred.

SYMPTOMS.

The symptoms produced by the condition are numerous and varied. In considering them it will be advisable to deal separately with the general symptoms and with those which are dependent on local conditions. The general symptoms are, broadly speaking, those of tuberculosis generally. It is remarkable, however, that these may be absent in some cases where the local disease is extensive. Amongst the most prominent of the signs and symptoms must be placed *wasting*. Not infrequently this may have been noticed some time before the local condition declares itself, and in some cases the patient is originally brought to a physician for the relief of this symptom. While the wasting process may be extensive, it must be admitted that many cases are seen in which general nutrition is good throughout (see No. 12). It is not improbable that the wasting is most marked in cases where the tuberculosis is generalized and where there is more than one focus of disease (see Cases 7 and 9); at the same time, it has been met with to a marked degree where the aural condition is primary, and where dissemination occurs only in the final stage of the condition (see Cases 1 and 10). We have no reason to doubt that the symptom is due to the general effect on nutrition caused by the absorption of the tuberculous toxin rather than to any local factor.

In some cases this wasting is augmented, if not caused, by the occurrence of intractable *diarrhœa*. This appeared in some of Milligan's cases and was well marked in Case 1 of the present series. It may occur at any stage of the condition, though from its nature it is more likely to be a terminal event. The *appearance of the patient* is in many cases suggestive of tuberculous mischief. The dryness of the skin which is so frequently noticed in tuberculous peritonitis, etc., is in many cases very marked, and cannot in every case be accounted for by the occurrence of diarrhœa.

The presence of *rashes* on the skin has not, apparently, been noticed by other observers, and if present it is improbable that they are due to the local condition but rather to a general toxic state. One case (No. 1) of the present series developed, a few days before death, a general erythematous rash, lasting for a day or two and then subsiding. It was followed by severe diarrhea, and on post-mortem examination miliary tubercles were found in the lungs and spleen.

In two cases of the present series (Nos. 2 and 9) scattered petechial hemorrhages occurred in the skin. They were few in number, occurred irregularly, and showed no typical distribution. In both cases they were seen several weeks before death and in only one case was there miliary tuberculosis. In both cases there were caseating tubercles in the spleen. In Case 2 these spots were noticed two months before death, and there was a large eruption of fresh hemorrhagic spots a few days prior to death. The occurrence of these spots cannot have any causal association with the aural condition, but seems to depend, as indicated by the splenic condition, upon some hemic condition caused by the dissemination of the tuberculous virus, and as such their occurrence in cases of tuberculous otitis has a grave significance.

The *temperature* chart of a patient suffering from aural tuberculosis displays nothing that can be recognized as typical. In cases uncomplicated by tuberculosis of other organs there may be little or no rise of temperature, as might be expected when we recollect the asthenic character of the condition. The presence of other organisms, however, tends to cause elevation and irregularity of the temperature. In cases where miliary dissemination supervenes we may see evidence of its occurrence in rapid alteration of the type of the temperature curve. In cases where there is extensive caseating tubercle, either locally or in some other organ, the typical swinging temperature may be observed, particularly where there are numerous foci. Some primary cases display marked variations in temperature.

Consideration of the pathologic processes involved, and of the complications to which the patient is liable, give many indications of the symptoms which we may expect in this condition. In acute cases the symptoms are those of an acute otitis media, and nothing pathognomonic is noticed for some time; and it is frequently not until the condition has entered

a chronic stage that suspicion is aroused by enlargement of the lymph-glands, facial paralysis, etc. In chronic cases the essentially asthenic nature of the processes fully account for the *absence of pain*, from which the patient is usually free. This absence has been commented upon by every one who has studied the condition. It has been suggested by Urban Pritchard (45) that this absence of pain can be accounted for by the lack of pressure on the nerves, the early perforation of the drum preventing the occurrence of increased tension in the cavum tympani. On the other hand, it has been suggested by Jobson Horne (42) that the absence of pain is due to the anesthetic action exerted by the decomposition products of the waxy envelopes of the bacilli themselves. The absence of pain is not peculiar to this condition, but is found in tuberculous osteomyelitis of any bone prior to the involvement of surrounding structures or the advent of mixed infection.

The occurrence of *discharge from the ear* is not infrequently—in the absence of pain—the earliest symptom noticed. This discharge presents many points, apart from its mere chronicity and the absence of associated pain, which may justly raise suspicion that the case is tuberculous. In many cases the discharge is thin and sanious—especially when the caries of the bone has been established. In some cases the discharge is flocculent and thick; in almost all cases it has a most offensive odor, from the presence of putrefactive organisms which gain access subsequently to the perforation of the membrana. If caries is present the discharge has a peculiar odor, which is easily recognized. Not infrequently the discharge is blood-stained and as this character is generally associated with the existence of caries, it usually persists when it once obtains. In some cases the discharge feels gritty from the presence of small spicules of bone, and a case in which it contained distinct bony sequestra which had been exfoliated has been recorded by Goldstein (10).

It has already been mentioned that ulceration of the tubercles early leads to *perforation of the drum*. This usually occurs early in the condition, and is not infrequently present when the patient is first seen. Owing to the frequent multiplicity of the tubercles it is not infrequent for the perforation to be multiple, as has been described by Politzer (23), Grimmer (6), Milligan (35), etc. By an extension of the ulceration the perforations may coalesce and produce a single perforation of large size;

indeed, it is nothing unusual to see the membrana almost entirely destroyed (see Cases 2, 5, 10, 11, 7). In addition to the multiplicity of the perforations, their position and appearance may be characteristic. Thus Blake and Buck (46) regard the presence of perforation in the posterior superior quadrant as almost pathognomonic of tuberculosis. The perforations are not usually surrounded by any marked zone of inflammatory redness, for, as has been pointed out, the process is essentially asthenic.

Through the perforations in the drum, *granulation tissue* may be seen. These granulations are more marked than in any other form of otitis media.

In many cases they have been seen to almost completely fill the cavum tympani. They are flabby and unhealthy, and readily bleed. From them sanious, foul-smelling discharge issues. They frequently show evidence of active tuberculosis, and caseous areas have been seen in them by Milligan (35) and Hurd (15).

The early *occurrence of caries* has already been mentioned. In such cases, as the processes commence as an osteomyelitis, it may be very extensive when the patient is first seen; indeed, in some cases the mastoid and petrous portions of the temporal bone may be reduced to a mere shell of bone, as in Cases 5 and 10. Milligan (35) has described a case in which this occurred on both sides, a thin lamina of bone supporting the middle cranial fossa being all that remained of the temporal bones. In many cases the carious condition is so obvious that it requires little demonstration. Though usually covered by granulation tissue, this is not always the case, and carious bone may be actually visible through the external meatus. A probe passed carefully into the cavum will frequently reveal the gritty, sugary nature of the bone beneath the easily-torn granulations. In advanced cases a probe so passed may not meet with any obstruction until the apex of the petrosa is reached. Thus in Case 10 a probe could be passed in horizontally for a distance of more than two inches from the external meatus before carious bone was touched. The caries may affect the ossicles, as has been already mentioned, and they may be completely destroyed, or become detached and be discharged. In many cases—particularly where there has been an osteomyelitis of the pars mastoidea—the caries involves the outer wall of the antrum and leads to the formation of a subperiosteal abscess

over the mastoid. Should this burst externally a fistulous track may be left.

The production of *facial paralysis* is easily understood when we recollect the course taken by the seventh cranial nerve in traversing the temporal bone. Seeing that the process producing the paralysis is itself usually of a chronic nature, it might be expected that the paralysis itself would occur gradually. This, however, is not always the case; often the paralysis comes on quite suddenly, as in Cases 5, 2. In such cases the paralysis is usually complete, but is not invariably so. Even though the facial nerve be affected in the aqueduct some of its fibres may escape. In a case observed by the writer in an infant of four months old there was slight paresis of the orbicularis palpebrarum on the right side, but no other evidence of facial involvement. Post-mortem examination showed the presence of caries of the right temporal bone, the facial nerve traversing the caries apparently intact. The tuberculous nature of this case could not be demonstrated, and the case is not included in our series, but that a tuberculous caries might similarly produce partial facial paralysis may be accepted as highly probable. The absence of lines in an infant's face sometimes makes it difficult to detect slight degrees of facial paralysis, as it is not manifest during repose. Its presence had not been noticed by the guardian of Case 7, in which it was nearly complete. The involvement of the seventh nerve in the aqueduct also leads, by implication of the fibres supplying the chorda tympani, to impairment of the sense of taste. It is obvious that this symptom is of little value in cases occurring in infancy, though it has been observed by Politzer in adults.

The *labyrinthine symptoms* are important, though not pathognomonic, and their production will be readily understood from the consideration of the pathological processes. Owing to the existence of caries bone conduction of sound is early impaired. The inner ear is liable to infection, not only by extension of the caries, but also—in an especial degree—by invasion through one or other of the fenestræ. The frequency of the involvement of the stapes predisposes to this. It is stated (35) that perforation of one or other of the fenestræ occurs in 33 per cent. of all cases. The involvement of the internal ear quickly leads to nerve-deafness, which is frequently absolute. The high degree of deafness in tuberculous middle-ear disease has been pointed out by Horne (28) and Milligan (35).

The occurrence of nerve deafness from involvement of the eighth cranial nerve, or cochlea, becomes of grave significance when we recollect that in five of Macewen's cases this was the path by which the meninges were affected.

The last symptom to which attention is drawn—*enlargement of the lymph-glands*—is certainly not the least important. The glands most usually involved are the mastoid, parotid, and retropharyngeal. Subsequently the deep glands of the neck become involved, and may form very large masses, as in Cases 1, 2, 7, 10, 3. It is important to note that these glands may be considerably enlarged before the middle-ear condition manifests itself by otorrhea, facial paralysis, or other symptoms, and, indeed, the presence of large glandular masses in the neck may be the first indication of any departure from health (as in Cases 1, 2).

The early enlargement of glands is the rule in tuberculous cases, and Milligan (35) states that it is rare to see cases without this symptom. According to Jobson Horne (42), the glands are rarely affected in cases when the ear is affected secondarily to other lesions, but their enlargement is a constant feature of primary affections of the ear.

DIAGNOSIS.

In discussing the symptoms it will be seen that these are not peculiar to the condition under consideration. It is important, therefore, that we should endeavor to appreciate the relative value of these symptoms in order that they may enable us to arrive at the diagnosis. Whilst the symptoms are of doubtful value individually, collectively they build up a picture which cannot easily be mistaken. It frequently happens, however, that the picture is not sufficiently complete until the patient is "the mere despair of surgery," and it is, therefore, necessary to see what symptoms are of special diagnostic significance in order that appropriate steps may be taken to eliminate the disease early in its course.

The multiplicity of perforations, the absence of inflammation surrounding them, and particularly their presence in the posterior superior quadrant—Blake and Buck (46)—have been emphasized as of special importance. In some cases tubercles have actually been seen on the membrane, or, through the membrane, on the internal wall of the cavum tympani; and in such cases the diagnosis should be readily made.

The absence of pain is important, for no other middle ear condition is associated with such extensive destructive changes unaccompanied by pain. Pain is also absent in sarcomatous conditions, and this possibility must be borne in mind, though other factors should suffice to distinguish the two conditions.

In no other condition does facial paralysis occur so early or with such frequency. It occurred in 45 per cent. of Milligan's (58) cases, while in his non-tuberculous cases he only observed it in 2 per cent. In the present series it was present in 33 per cent. We may contrast this high percentage with the figures given by Lake (47), who in 658 consecutive cases of suppurative otitis media only encountered facial paralysis in four. The presence of this sign is regarded by Grunert (59) as almost pathognomonic of tuberculosis in cases of chronic otorrhea.

The character of the discharge, foul and sanious, the early enlargement of the neighboring glands (in primary cases), and the occurrence of an indolent fistula over the mastoid, are all points which have special significance. In such cases as it can be detected the presence of stapedia mischief has been pointed out by Haike (40) as indicative of a tuberculous condition. The presence of profuse granulations is regarded by Gaudier (60) as a suspicious sign.

Jobson Horne (42) emphasizes the diagnostic importance of marked loss of hearing-power, and insists on the usual absence of headache, and on the occurrence of hemorrhages; while Politzer (23) lays stress on the rapidity with which the membrana is destroyed, and on the importance of the detection of carious bone on the inner wall of the cavum. When upon examination we find the membrana almost completely destroyed, the cavum filled with unhealthy granulations beneath which gritty bone can be felt, or when carious bone is visible, we cannot but strongly suspect the condition to be of a tuberculous nature, especially if the patient be an infant.

The discovery of the bacillus of tuberculosis by Koch placed in our hands a method of diagnosis of greater, and even of absolute, certainty. If the condition be one of tuberculosis we should expect to find the specific bacillus in the discharge. This was first done by Eschle (4) in 1883, and has since been done by numerous observers. Nathan affirmed that he was able to detect it in every case, but certainly most observers have been less fortunate, and there are undoubtedly cases in which the bacillus is not present in the discharge.

Since the discovery of the bacillus in the discharge by ordinary microscopic examination depends on its acid-fast staining reactions, it is important that we should realize that numerous other bacilli possess this reaction, which has been shown to be due to the presence of an envelope of a waxy nature surrounding the bacillus.

Of these the best known are *B. leprae*, *B. smegmae*, bacillus of timothy grass, and the butter bacillus. To these must be added others. Wingrave (49) in discussing the question relative to the occurrence of tubercle bacillus in the aural discharge draws up a list of eight bacilli known to have acid-fast properties. This list includes those already mentioned, and also the bacillus of syphilis (Lustgarten), and some bacilli associated with pulmonary gangrene, fetid bronchitis, and bronchiectasis. It is important to remember that many of these possess characters in which they differ from tubercle bacillus. Thus the *B. smegmae* is only found in the secretions of the external genitals, and it is easily bleached with alcohol; *B. leprae* practically never occurs in this country; Lustgarten's bacillus of syphilis is doubtful. The butter bacillus is probably a "grass bacillus" allied to that of timothy grass.

The acid-fast properties of the bacilli associated with pulmonary gangrene and bronchiectasis have been attributed by Fraenkel (50) to their occurrence in a medium rich in fatty acids and fats produced by putrefactive changes. It will thus be seen that the probability of acid-fast bacilli found in the aural discharge being identical with tubercle bacillus is great. In a series of 100 cases examined by Wingrave (49), twenty-four showed the presence of acid-fast bacilli in the discharge and the inoculation test showed that these were tubercle bacilli in seventeen cases. It is interesting to note that of the remaining seven cases, five were patients suffering from tuberculosis elsewhere.

It has been shown that the acid-fast reaction is due to the presence of a waxy envelope surrounding the bacilli (51). When we recollect that the same reaction is possessed to a high degree by the squames found in some cases in the middle-ear secretion, and that the secretion of the external ear consists largely of a waxy material, we at once see a possible source of error in relying on the detection of tubercle bacilli by its staining reactions only. It is possible that bacilli which are not normally acid-fast may acquire this property adventi-

tiously as a result of their growth and existence in a medium rich in fatty or waxy bodies. Thus Fraenkel (50) has shown that the bacillus which shows acid-fast properties in the secretions of pulmonary gangrene loses this property when cultivated on media in which fatty bodies do not exist. It is notable, however, that we have never met with acid-fast cocci in the discharge, though any cocci that may be present must be subject to the same conditions, and grow in the same waxy medium, and therefore might be expected to acquire this reaction whenever we find that the bacilli have acquired it adventitiously.

In order to obviate, so far as possible, these sources of error, it is advisable that the discharge to be examined be taken from the deepest accessible source, and then only after the cavity has been repeatedly flushed out. Films showing the presence of acid-fast squames should be discarded, for it has been pointed out by Wingrave that particles of these squames when broken up may be mistaken for tubercle bacilli.

In many cases it is possible to obtain scrapings from the granulations, and in them the tubercle bacillus may be found in large numbers. Histologic examination of the granulations may show the presence of caseation or giant-cell formation.

While it has been shown that some cases are not tuberculous yet show acid-fast bacilli in the discharge, the method fails in a far larger number of cases through inability to detect tubercle bacilli in cases which are tuberculous. The discovery of the bacilli is nearly always attended with considerable difficulty, and in the majority of cases it is only after prolonged search through many films that they are detected. It is stated by Brieger that the bacilli are not infrequently absent from the discharge. In some cases, however, this difficulty disappears, and they are met with in considerable quantities. This usually occurs in acute cases and early in the condition, for, as has been pointed out, the bacilli are frequently destroyed in the putrefactive changes initiated by other organisms.

Examination of the neighboring lymph-glands may show the presence of typical tuberculous changes and thus clear the diagnosis. If doubt still exists our final court of appeal lies in experimental inoculation of animals, as has been done by Milligan (7), who thus obtained positive proof in eight out of ten cases submitted to this method. (It is of interest to note that the two negative cases were patients aged nineteen and

eleven years respectively, while the eight positive were all patients under three years.)

This method involves time and is frequently impracticable except in hospitals associated with pathologic laboratories. For practical purposes, then, we must rely on the clinical appearances and history, and the microscopical examination of the discharge as the joint foundations of our diagnosis, and in most cases these give sufficient data. In cases of chronic otorrhea, without pain, and associated with multiple perforations or destruction of the membrana, temporal caries, facial paralysis, or enlargement of the lymph-glands, we may accept the presence of acid and alcohol-fast bacilli in the discharge as proof of the tuberculous nature of the disease with confidence.

CASE 1.—M. H—, aged 9 months. When patient was seven months old a swelling was noticed behind and below the right ear, from which a discharge was observed three weeks later. Patient was the youngest of three; the other two had never shown any signs of tuberculosis. Parents healthy. The mother's brother died of phthisis. Patient was breast-fed entirely until admission. No history of previous illness except chicken-pox some months ago and diarrhea and cough just prior to present condition.

On admission—General condition poor. Marked swelling over and below mastoid on right side; discharge from right ear. Glands below right ear enlarged.

The mastoid abscess was opened and the underlying bone found to be carious, a perforation into the antrum being found. This was opened up and antrum and cavum found to be filled with debris. The ossicles were detached and carious and the membrana was found to be almost entirely destroyed. There was extensive caries of the temporal bone. The carious bone was thoroughly scraped away and the antrum and cavum were laid freely open. The posterior wound was closed and the cavity packed through the external meatus. Examination of debris from the antrum and cavum showed presence of tubercle bacilli in large numbers. Subsequently the local condition remained satisfactory but patient's general condition did not improve. Six days after operation temperature rose to 102.4° F. Suddenly an erythematous rash developed, diarrhea and later a cough set in, and patient died three days later.

Post-mortem.—The local wound was quite clean. The apex of the right petrous temporal bone was carious, a small collection of caseous debris in this position being separated from the middle ear by a layer of apparently healthy bone. The left petrous temporal also showed some caries. There was no meningitis and no thickening of the dura covering the temporal bones. The left lung showed a patch of tuberculous bronchopneumonia in the basal lobe. Miliary tubercles were present in both lungs and in the spleen. Examination of the other organs showed no sign of tubercle elsewhere.

CASE 2.—M. G—, aged 3 months. Patient was healthy until three weeks before admission, when he began to “go back” and a lump was noticed below the left ear. This increased in size and a week later complete facial paralysis set in suddenly on the left side. Three or four days later discharge from the left ear was observed. Patient was breast-fed until admission to hospital. No history of tuberculosis in the family.

On admission—Nutrition fair. Complete facial paralysis on the left side. Below the left ear were large masses of glands; behind the ear was a fluctuating swelling. From the ear thick fetid discharge issued, examination of which revealed the presence of tubercle bacilli. Examination of other systems revealed nothing abnormal. As the membrana was completely destroyed an attempt was made to improve the local condition by antiseptic flushing, etc. There being no resulting improvement locally, the enlarged glands—which were mostly caseous—were removed, the mastoid was exposed and found to be perforated. On opening up the antrum it was found to be filled with caseous debris. The cavum contained similar material and the adjacent bone was carious. In the tegmen tympani was an irregular shaped opening covered by thickened dura mater. The ossicles were lying loose and were carious. All the carious material was freely scraped away and the cavity was packed with iodoform gauze through the external meatus. Subsequently the cavity was syringed with peroxide of hydrogen until discharge ceased, after which it was kept dry. Seven days after operation temperature rose and cough developed and became incessant, diarrhea set in and purpuric spots appeared on the skin of the trunk. Patient sank rapidly and died twenty-three days after operation.

Post-mortem.—The local conditions appeared quite satisfactory. There was no meningitis, though the dura was thick-

ened over the aperture in the middle cranial fossa. Miliary tubercles were found scattered through the spleen and both lungs. There was no sign of tuberculosis of the bronchial or mesenteric glands or elsewhere.

CASE 3.—J. D—, aged 2 years. Patient was under treatment for tuberculosis of the retropharyngeal and deep cervical glands. There was nothing suggestive of middle-ear mischief—no otorrhea, no facial paralysis, no enlargement of mastoid glands. Subsequently signs of tuberculosis of the right apex developed, together with signs of enlargement of the bronchial glands and later of laryngeal tuberculosis, and a fatal termination ensued. Patient had been breast-fed nine months, and there was no family history of tuberculosis.

Post-mortem showed extensive consolidation of upper lobe of right lung, with a small cavity—the size of a pea—in front. The pleura over the apex was thick and laminated. Bronchial glands were caseous. The larynx showed ulceration of the aryteno-epiglottidean folds. Cervical glands were caseous in the right carotid and supraclavicular triangles. The pericardium showed a small patch of inflammation near its reflection from the great vessels. Miliary tubercles were scattered throughout both lungs; mesenteric glands were caseous. The right temporal bone was carious between the apex of the pars petrosa and the cavum tympani, which contained caseous debris. This was examined, and tubercle bacilli were found in it. The membrana was intact.

CASE 4.—E. F—, aged 1 year and 1 month. Patient was admitted suffering from otorrhea on the right side, of one month's duration. A week after commencement of the discharge swelling over the mastoid was seen. Patient was breast-fed until admission, and there was no family history of tuberculosis.

On admission—General condition fair. Slight swelling over the right mastoid; no facial paralysis; foul-smelling discharge from ear. The discharge was examined for tubercle bacilli, but the result was negative. Examination of other organs revealed nothing of note. Patient was operated upon, the antrum being found to be perforated high up and far back. Antrum was filled with caseous debris and granulation tissue, beneath which was carious bone. The membrana had a single perforation of very large size. Operation was completed as in Cases 1 and 2. Scrapings from the granulation tissue were examined, and tubercle bacilli found in them.

Subsequently the local condition did satisfactorily, and the wound remained dry. Patient's general condition, however, was not very satisfactory, and he was taken home by his parents. Six months later he was reported to be in fair general health.

CASE 5.—P. S—, aged 6 years. Eighteen months prior to admission facial paralysis suddenly occurred on the right side. This was followed soon after by discharge from the right ear. Gradually the glands in the neck became enlarged. The aural discharge has continued ever since. Previous illnesses include *tabes mesenterica* when two years old.

On admission—There was absolute paralysis of right side of face; the cervical glands formed bulky masses below the right ear and over the mastoid. Glands were also felt in the anterior triangle on the left side. From the right ear issued abundant fetid discharge, examination of which showed tubercle bacilli only after several films were examined. Four days after admission meningeal symptoms set in, and death supervened fourteen days later. Prior to death lumbar puncture revealed presence of lymphocytosis and turbidity of the cerebro-spinal fluid, and tubercle bacillus was found after centrifuging. Permission for post-mortem could not be obtained.

CASE 6.—E. B—, aged 1 year and 9 months. Patient was admitted with history of diarrhea and vomiting for a fortnight. A week later cough set in and became urgent. Coma supervened gradually, and was nearly complete when patient was admitted. No history of facial paralysis or otorrhea. Patient had been breast-fed until sixteen months, and there was no family history of tuberculosis. Patient died twelve hours after admission, never having regained consciousness.

Post-mortem showed acute pneumonic phthisis of both bases, with early excavation of right base. Bronchial glands enlarged. On opening the skull the meningeal veins were found to be extensively thrombosed on both sides, and there was hemorrhage over the left Rolandic area. On opening the temporal bones caries was found on both sides, the middle ears containing thick pus, which, on examination, was found to contain tubercle bacilli and streptococci.

CASE 7.—J. J—, aged 2 years and 6 months. Patient had been gradually wasting for a year. She had had otorrhea for four months and enlargement of the cervical glands for near-

ly a year. Facial paralysis had not been observed by her guardian. Patient was youngest of six, of whom three died—cause unknown. Patient was breast-fed for seven months, and weaned on account of the mother's health. Her mother died a year ago of phthisis.

On admission.—General nutrition very poor. There was almost complete paralysis of left side of face. From the left ear was offensive discharge. The cervical glands formed large masses on both sides of the neck. Some of the glands appeared to be softening, but there were no actual abscesses. There was percussion dullness behind the manubrium sterni. Masses of glands were palpable in the abdomen, and the liver was enlarged. The lungs appeared healthy. Examination of the aural discharge showed tubercle bacilli in every film. Patient was removed from hospital, and died at home six months later.

CASE 8.—G. H—, aged 1 year and 6 months. Patient was admitted for tuberculosis of lungs and peritoneum of two months' duration. He had otorrhea from left ear for three months. He had been breast-fed for eleven months.

On admission.—In addition to signs of peritonitis and pulmonary tuberculosis patient had slight discharge from both ears. Both membrane were perforated. Tubercle bacillus was found in discharge from left side. There was no facial paralysis, and no glands were palpable. Patient died a week after admission.

Post-mortem.—Patch of tuberculous broncho-pneumonia in right apex; bronchial glands caseous; general tuberculous peritonitis of the adhesive type; mesenteric glands caseous; liver showed a caseous area, to which the bowel was adherent. No signs of tuberculosis elsewhere except caries of left temporal bone in region of inner ear and mastoid, the tympanic cavity being filled with debris.

CASE 9.—G. F—, aged 1 year. Patient had history of otorrhea on right side for three months, with enlargement of mastoid glands, which had been lanced two months ago. Patient had been wasting for some months, and had had a purpuric rash for six weeks. Patient had been bottle-fed on patent foods entirely. No family history of tuberculosis.

On admission.—Patient was wasted, and had a peculiar waxy-yellowish color. Over the right mastoid was a discharging sinus. There was no aural discharge, but the glands

below the right ear were enlarged. The membrane was intact. Large masses of glands were palpable in the abdomen and the spleen was palpable. The sinus over the mastoid was opened up, and the carious bone scraped. The antrum was found to be filled with debris, in which, on examination tubercle bacillus was found. Subsequently, pulmonary symptoms set in, Eustace Smith's murmur became audible, and increased. Death occurred five weeks after operation.

Post-mortem.—Extensive pneumonic phthisis of right upper lobe, patches of broncho-pneumonic tubercle in both lower lobes. Bronchial glands enlarged and firm. Mesenteric glands caseous. Spleen enlarged, and containing caseous nodules as large as a marble. Permission to open the skull was not obtained.

CASE 10.—W. E—, aged 4 months. Patient had been breast-fed one month. The mother has phthisis. Otorrhea appeared on the right side when patient was two months old. This was speedily followed by swelling of the glands behind and below the ears, and later of those in the parotid region. Facial paralysis set in five weeks before admission.

On admission.—There was complete paralysis of right side of face. There was copious fetid discharge, containing tubercle bacilli in very large numbers (ten to fifteen in almost every field), from the right ear. The membrane was completely destroyed, the meatus opening into a large cavity. A probe passed in horizontally encountered carious bone at a depth of two inches. The glands were much enlarged below, behind, and in front of the ear. The general condition was considered to be too enfeebled to admit of radical operation. Patient died a month later.

Post-mortem.—Mesenteric glands caseous. Miliary tubercles in both lungs. There were two collections of greenish pus in front of the sterno-mastoid muscle on the right side. The neighboring glands were enlarged and caseous. In dissecting them up one opened into a large cavity with irregular sloughing walls. The inner wall was composed of the carious remains of the temporal bone. The external meatus opened directly into the cavity. The mastoid antrum and cavum were completely destroyed. On opening the skull thickening of the dura covering the tegmen tympani was seen. The tegmen itself was carious. The bone forming the outer wall of the antrum and that forming the posterior wall of the external meatus were completely destroyed.

CASE 11.—V. D—, aged 5½ years. Patient has had enlarged glands on both sides and double otorrhea (intermittent) since he was ten months old. There is a family history of tuberculosis. Patient had been breast-fed.

On admission patient had discharge from right ear (none from left ear). The right membrane was completely destroyed and carious bone was palpable. Tubercle bacillus was found in the discharge in small numbers. There was complete nerve deafness on right side, and hearing on left side was markedly impaired. Patient had adenoids, which were subsequently removed. Enlarged glands were present in the parotid region—where there was a discharging sinus—and below the ear in front of and behind the right sternomastoid muscle. These glands were excised or scraped, and found to be typical caseating glands. The antrum was opened up, and found to be filled with caseous debris. The walls of the cavum were carious. The carious bone was removed, and the middle ear packed through the meatus. Patient's subsequent progress was satisfactory.

CASE 12.—A. H—, aged 2 years and 9 months. Swelling over the left mastoid came on when patient was two years and seven months. This was soon followed by otorrhea. There was the history of night-sweats for three months. Patient had been breast-fed for thirteen months. The mother is stated to be phthisical.

On admission.—There was otorrhea on left side, a fluctuating swelling was present behind the ear. Enlarged glands were present in the posterior triangle. There was no facial paralysis. The aural discharge contained tubercle bacilli in very large quantities. There was impaired percussion-resonance over the manubrium sterni, Eustace Smith's murmur was present. No palpable glands in the abdomen.

The antrum was opened up and found to be filled with caseous debris. It was cleared out, and the complete operation was performed. A caseating gland below the ear was scraped out. Patient made a good recovery, and after-progress was quite satisfactory.

PROGNOSIS.

Of the above twelve cases it will be seen that no fewer than nine terminated fatally. In two cases the aural condition was not suspected until it was revealed on the post-mortem table.

It will also be seen that of the nine fatal cases no less than eight had tuberculous lesions elsewhere at death, thus substantiating that the condition does not usually reveal itself prior to the commencement of dissemination. It is largely on this account that the prognosis is so gloomy. Miliary tuberculosis might be expected to be of frequent occurrence when we recollect the age-incidence of the condition and the frequent association of miliary and of bone tuberculosis be considered. In the present series it was seen on four occasions, and the presence of meningitis in another case (No. 5), not subjected to post-mortem examination, points to its occurrence in a fifth.

Politzer, as has already been mentioned, is of opinion that the condition never undergoes spontaneous cure, and even casts doubt on the authenticity of such cases as have been reported cured.

The prognosis of the condition when it arises as a complication of phthisis no doubt largely depends on the course taken by the pulmonary condition; and since this complication most frequently arises late in the course of phthisis—especially where there is cavitation—we can rarely expect to see recovery in such cases, though it has been reported by Milligan and others.

Of the general considerations which might be held to account for the bad prognosis of such cases as are to be considered as primary, the most important are the age-incidence, the affection of bone, and the unsatisfactory results of treatment.

It has been shown that the condition when primary is more frequent in infants under two or three years of age than at any other age, and the feeble resistance to tuberculosis shown by patients at this age and the frequency of miliary dissemination largely account for the frequency of a fatal issue. The affection of the bone is also of significance in view of the frequency with which miliary tuberculosis arises from a focus in bone.

The unsatisfactory results of treatment are, unfortunately, only too patent. Milligan states that "at least 40 per cent. of my cases of proved tuberculous infection have succumbed to the disease." In the present series the case mortality was 75 per cent., though it is only fair to state that in 16 per cent. the condition was unsuspected during life and no local treatment had been employed. It does not come within the scope of the present paper to discuss treatment except in so far as it affects the prognosis. There are numerous reasons why operative

interference has done so little to reduce the case mortality. It must be remembered—and this cannot be too freely insisted upon—that treatment is usually commenced too late, the condition is usually too far advanced for half-measures, and the patients are too young, and usually too much reduced in strength, to stand extensive radical operative interference.

Amongst the factors regarded as of most evil omen by Milligan are the presence of extensive caries, facial paralysis, copious blood-stained discharge, of massive enlargement of the lymph glands, and the presence of tuberculous lesions elsewhere; and it will be seen that these are the very symptoms for the relief of which the patient first comes under the notice of the surgeon. Briefly, we may say that the insidious onset and the absence of pain are the causes of the high death rate, for the patient is rarely subject to treatment until the condition locally has become too advanced for cure or until the dissemination has become already established.

The presence of extensive disease in an infant at an age when radical operative proceedings are not well borne, and at which widespread dissemination through the blood-stream is prone to occur, affords little prospect of successful treatment. It must not, however, be forgotten that some primary cases even at this early age if promptly treated may improve or recover. Successful cases, in which cure has resulted, have been reported by Milligan and others even in patients in the first year of life. Of few other chronic conditions can it with equal justice be said that the condition most favorable to prognosis is the early diagnosis of the disease.

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ABSTRACTS FROM CURRENT OTOLOGIC, RHINOLOGIC AND LARYNGOLOGIC LITERATURE.

I.—EAR.

Symptomless Mastoiditis, Followed by Meningitis and Death.

A. B. BENNETT, Washington (*Medical Record*, April 13, 1907.) This case is unique in that the patient was under observation for some two months before his death, and at no time showed any mastoid symptoms whatever, and no symptoms suggestive of any serious ear trouble until four days before death, when he became ill with headache, vertigo, nausea and vomiting. On admittance to hospital the temperature ranged between 97.4 and 98, and he seemed better. The tympanic membranè showed nothing. There was no mastoid tenderness on either side. The nausea, explosive vomiting and vertigo occurred two days after admission.

Both mastoids were operated on, one side having a tremendous amount of carious bone, the other side much less. The patient never recovered consciousness after the operation, but died in twelve hours. At the autopsy there was a markedly congested pia mater covered with purulent lymph, and on removing the brain and cutting the spinal cord, there was an outflow of blood and pus in large quantities, the brain being literally bathed in pus. There was a diffuse leptomeningitis over the entire cerebrum and cerebellum, with pus in the lateral ventricles. The right lateral sinus was thrombosed, and it appears that the leptomeningitis was probably of otic origin. There was no fever until four hours before the operation, and at no time was there any mastoid tenderness. The membrana tympani never perforated or discharged, but the conditions steadily improved, as did also the hearing, and the symptoms of meningitis were the first symptoms that pointed toward operative interference.

Richards.

Aspiration in Otitis Media Acuta.

PERCY R. WOOD, Marshalltown, Iowa (*Medical Record*, April 13, 1907), has devised an aspiration apparatus for use in acute otitis media, consisting of a glass tube three inches long with a reservoir for exudates. The aural extremity tapers and

is tipped with rubber, and to the other is attached a syringe with a good sized air chamber. When in place, the rubber tipped end seals the opening, the piston is drawn out gently and retained until the reservoir fills, or until no further exudates, blood, or serum escape. By this means these cavities are relieved of vast quantities of pathological secretions which would never entirely drain away or be absorbed, but remain throughout life to threaten the integrity of the parts.

Richards.

The Eustachian Tube, Its Anatomy and Its Movements: With a Description of the Cartilages, Muscles, Fasciae and the Fossa of Rosenmüller.

W. SOHIER BRYANT, New York City (*Medical Record*, June 8, 1907). An anatomic study, the conclusion of which is "The physiological function of ventilating the tympanic cavity is accomplished mainly by the dilator tubae or levator palati. The mechanism which allows the opening of the tuba auditiva is the backward pressure of this muscle on the angular process of the alar cartilage, which swings backward, upward, and inward on its superior attachment, dragging with it the floor of the tube and forming a triangular ostium."

Richards.

The Value of the Blood Clot as a Primary Dressing in Mastoid Operations.

CLARENCE J. BLAKE, Boston, Mass. (Read at Toronto, British Medical Association, 1906). The method consists in making the primary incision as clean-cut as possible, the retraction of the periosteum without injury, the controlling of the bleeding by hemostats or broad-bladed retractors, the making of the opening in the outer mastoid cortex so large as to include all areas of defective bone, and then the careful removal of all diseased bone by means of chisels and sharp, long tipped, unfenestrated spoons, down to the inner cortical walls, taking especial care to remove the bases of the trabeculous projections with their interlamellar diploe and to search out adventitious cortical cells and, by curetting, make them a part of the general cavity, which is then packed firmly with small, dry involuted gauze sponges. These sponges are allowed to remain for a minute or more, then the area is carefully examined and all necrotic or suspicious areas excised or curetted. This is continued until the operator is satisfied

that the mastoid cavity is absolutely free from diseased bone. The sponges are then removed, the cavity in the mastoid allowed to fill with blood from the cut surfaces of the soft tissues, and as soon as clotting is evidenced, the wound edges are brought into position and retained by gut sutures or pressure pads, the lower portion of the incision being left free for seepage of serum from the blood clot.

The drum head is incised by a crescentic cut following the posterior superior periphery, and the horizontal mucous folds, if present in the antrum locality, are also cut, since these sometimes present an obstruction, by their engorgement and swelling, to effective drainage. The canal and middle ear are carefully cleansed and stopped with a gauze wick.

The percentage of primary healing, that is to say, cessation of serous seepage in the lower portion of the mastoid wound, absence of granulomata, and healing within eight to ten days after operation, varied from 12 to 50 per cent, the latter being selected cases. The total number of cases operated on by this method was less than 250.

Inasmuch as this method, when it is successful, results in mitigation of pain and discomfort and shortening the duration of after-treatment, the author thinks it is worth striving for, since success presupposes an advance in the surgical thoroughness of the operation itself and the application of a judicious consideration of conditions, which is as much a part of the real domain of surgery as is the application of structural knowledge or of manipulative skill.

If the mastoid cavity is thoroughly cleansed and safeguarded from without, it is subjected to reinfection through one channel, namely: that leading from the middle ear, and this cavity should of itself be thoroughly cleansed and independently drained through the external auditory canal.

In case the blood clot does break down and comes away entirely, it results in the formation of foundation granulomata, which are a basis for subsequent repair, with speedier and more satisfactory results in healing than are obtainable when the wound is dry-packed from the beginning. The only cases in which the blood clot dressing is inapplicable are those in which, on account of pyogenic invasion of surrounding structures, it is desirable to keep the mastoid cavity open as a path of access, and those in which the systemic condition of the patient, or the extent of the local infection, do not warrant the expectation of speedy repair.

Richards.

Chronic Middle Ear Suppuration and Surgical Interference.

EMIL AMBERG, Detroit (*Journal of the Michigan State Medical Society*, March, 1907), has collated the reports as regards the time of healing after the radical mastoid operation from some thirty different operators, the average time being two months and twenty-six days. His conclusion is that only exceptionally a chronic middle ear suppuration which does not respond to mild treatment without more thorough surgical interference, should be allowed to continue. The less radical procedure should first be considered, and the more radical measures not delayed too long.

Richards.

Ototympanitis Suppurativa Acuta and Tympano-Mastoiditis Suppurativa Acuta.

EMIL AMBERG, Detroit (*Leucocyte*, February, 1907). On account of the fact that the mastoid cells are part of the middle ear, the author regards the term "otitis media" as incorrect, and suggests the term "ototympanum" and "ototympanitis" for the commonly accepted otitis media acuta, and "tympano-mastoiditis acuta suppurativa" for acute inflammation of the mastoid.

Richards.

Headaches Due to Aural Disease.

PHILIP HAMMOND, Boston (*Journal A. M. A.*, November 1, 1906). There is an intimate connection between the innervation of the ear and the central nervous system. Headache may be due to various aural causes, among them cerumen in the canal, obstruction of the Eustachian tubes, inflammation of the middle ear, chronic suppuration, pressure from exfoliated epithelium, and cholesteatoma. The treatment should be that for the aural condition which is present.

Richards.

The Tumors of the External Auditory Canal (Melanoma).

ERICH DALLMANN (*Archiv für Ohrenheilkunde*, Bd. 10, Heft 1 and 2, 1906) reports the case of a tumor of the external auditory canal. The patient was a woman, aged 44 years, who had been treated in the Surgical Clinic in Halle, for a fibroma molluscum of the left femur, over fifty pounds of which had been removed at different times. Distributed over the entire surface of the body are small pigmented warts

from the size of a seed to a hazelnut. A week before the patient presented herself to the ear clinic in Halle for treatment, she noticed that she could not hear well with the left ear. She had never had trouble with her ears before. For three days she had also suffered from severe pain in the left side of the head. On examining the ear it was found that the region of the tragus and mastoid were sensitive to pressure. A tumor was present in the external canal, situated about at the junction of its cartilaginous and bony portion and entirely occluding its lumen.

The tumor had a bluish-brown color and was of rather dense consistency. The right m. t. was normal. Hearing test showed that the difficulty was purely in the sound-conducting apparatus. The tumor was removed with the hot loop. There was a slight injection of the m. t. around the handle of the malleus, the drum membrane otherwise being practically normal. The pain in the left side of the head was considered to have been caused by the pressure of the tumor.

On microscopic examination the growth was found to be a papillary one, a melanotic skin nevus.

The author believes that the growth, because of its remarkable richness in cells and the presence of pigment in the cells, may be a melanosarcoma, that is, it may represent the change of a benign growth (papilloma) into a malignant growth.

There had been no recurrence three months after the operation.

Theisen.

Clinical Experiences with Artificially Induced Hyperemia According to Bier's Method in the Treatment of Otitis Media.

F. ISEMER (*Archiv für Ohrenheilkunde*, Band 69, Heft 1 and 2, p. 131). Under the direction of Prof. Schwartz, the author has tried Bier's hyperemia upon 12 cases of suppuration of the ear. In 9 of the cases the mastoid was more or less involved. Eleven of these were acute and one chronic. The technic used in producing hyperemia was the same as advocated in the clinic at Bonn; the usual elastic bandage tightened by means of hooks or some other simple device was used.

The length of application varied between 20 and 22 hours during the first day, being diminished as the case improved.

The hyperemia was well supported in each instance. As already noted by Keppler, the pain diminished upon application

of the bandage. The surgical interference may have been largely responsible for this, as in each case paracentesis was performed when indicated. Of the 12 cases treated, in spite of long hyperemia, 5 of them came to the operating table. Four of these five cases were infections due to diplococcus. In each case the author noted apparent benefit as regards the general condition of the patient. The author cites one case in which a marked improvement in the general condition of the patient was by observation, although it came under treatment with most critical symptoms. So improved was he after one or two days, that he was able to play with his fellow patients as though completely well. This improvement was not permanent. Without any external cause, violent symptoms developed as marked by high fever, swelling behind the ear, extreme pain and increasing tenderness on pressure. The operation was performed at once, and showed the most extensive destruction of tissue, reaching as far as the dura and the sinus, causing extradural and perisinual abscesses. . . . These severe disturbances, which had developed during the treatment, were masked by apparent benefit, although a cure without operation was impossible.

Bier saw a case of abscess of the temporal lobe which, under the hyperemia treatment, improved so markedly that the patient felt entirely well, and could leave his bed. Suddenly the patient's condition was much worse. The operation was performed and a large abscess of the temporal lobe was exposed. Patient died in two days.

The remaining cases, 5 of which were complicated with mastoid disease, healed with two exceptions. The method of treatment seemed to have brought about a cure in less time than is ordinarily necessary. The author believes that one can be easily deceived in laying too much value upon a method which has been tried in so few cases. Two cases remained uncured. These were due to infections after scarletina.

Bier considers the excellent functional results which he attained as one of the greatest advantages of this method. The author, however, does not find that there is any improvement over previous methods. In this respect he also considers the method as one extremely dangerous in the hands of the general practitioner, as the symptoms suddenly become threatening, and the proper time for the operation may pass unknown.

Resumé:

1. The treatment of hyperemia is dangerous, as the apparent benefit will conceal the proper moment for surgical interference.

2. It remains for further statistics to decide for which forms of information, under what stage the treatment is indicated, and how long it should be continued before operative interference.

3. Specially dangerous is the protracted treatment with hyperemia when the infection is due to the diplococcus.

4. In case of intracranial complications, sinus thrombosis, extradural abscess, and brain abscess, the method is positively useless.

Harris (Gignoux.)

Cholesteatoma of the Ear.

DE STELLA (*Revue Hebdomadaire*, January 6th, 1906). Attention is called to the wide difference between the false and the true cholesteatoma. One is of comparative frequency and is usually free from serious consequences, the other, so rare in its occurrence that Politzer has never seen a case, is fraught with grave danger to life. The latter is really an endothelioma. The situation in the auditory canal, antrum and middle ear is overturned. The etiology appears not yet to be definitely understood. It is known that it can develop without any participation of the canal epithelium. The hyperplasia of the endothelium may occur independently of any inflammatory process. It is especially the complications that make the true or endothelioma so dangerous; many cases develop meningitis. As is known, the symptoms are often insidious and tumor is recognized only by chance.

The author regards the operative removal a simple one. He advises always closing the postoperative wound. De Stélla had recently seen a case of true cholesteatoma in a man of fifty, who had suffered from several attacks of acute otitis media suppurativa—the last, ten years before. Six weeks before consulting de Stella, he was seized with pains in the ear, followed in three weeks by a facial paralysis upon the affected side. The canal was found filled by cholesteatomatous lamellae extending into the attic and presumedly the antrum. A probe could be introduced through the posterior wall into a very large cavity in the mastoid behind. The operation revealed the characteristic excavation involving antrum, attic and mastoid cells. The case made a successful recovery.

The Treatment of Acute Otitis Media Purulenta and Mastoiditis by Means of Artificially Induced Hyperemia (Bier's Method).

DR. KOPETSKY (*New York Med. Journal*, July 14, 1906). An excellent statement of this most promising method of treatment, which Bier first brought forward in 1903. Keppler and Heine were the first to apply it to the ear. Keppler reported 21 cases. Of these, 11 were cases of acute otitis with a mastoid involvement. These all recovered without operation. Heine employed the method in 19 cases. Of these, there were 15 acute with and without mastoiditis; of which seven recovered in from six to ten days without operation. One of these relapsed and required an operation later. Kopetsky tried the method in six cases of acute otitis with mastoiditis. In five of these there was a recovery without operation in from two to thirteen days. The technic as advised by Bier was the one employed. The patient is put to bed. A slightly elastic bandage one to one and one-half inches wide and provided with hook and eyes is applied to the neck with pressure to produce slight congestion but no pain. This is allowed to remain 24 hours. During this time it may be necessary to tighten the bandage if it becomes loose. Raising the foot of the bed still further assists in securing the hyperemia.

Exostoses and Hyperostoses of the Ear Canal as a Cause for Severe Purulent Otitis.

HANOVER (*Archives of Otolaryngology*, Vol. XXXV, No. 6). Though the formerly accepted statement that hyperostoses of the canal occur after middle ear diseases is now discredited, the opposite condition, namely: that occluding exostosis can produce middle ear disease, is not mentioned in literature.

A patient, aged 19, has suffered for at least 11 years from an occluding exostosis in the right canal. Recently he complained of deafness and headache. There are no signs of inflammation. On detaching the auricle and removing the tumor, the M. T., ossicles and outer attic wall were found absent. The tympanum contains detritus and the antrum is small and filled with granulations. Three and one-half weeks later symptoms of pyemia developed, and further operation revealed a small fistula extending to the sinus.

A second case, that of a woman, aged 38, presented large exostoses in both auditory canals. A short time ago the patient noticed a diminution of hearing and a slight discharge from her

left ear. On irrigating the canal with a tympanic canula the fluid passed into the pharynx. Daily irrigation followed by the use of alcohol, improved the condition in the left ear, but the persistence of the mucus secretion and mastoid tenderness necessitated a mastoid operation one year later. The hyperostosis was not removed, but the ear canal is dry and free from detritus.

Campbell.

Herpes of the Auricle with Neuritis of the Facial Nerve.

SARAI, Japan (*Archives of Otology* Vol. XXXV, No. 6). This association has not been frequently noted. The only textbooks which report observations of this occurrence are those of Politzer and Gruber. In the two cases cited, whereas the herpetic condition disappeared in about two weeks, the facial paralysis persisted in the one case six weeks, and in the other four months. The vesicles were not situated in the area of distribution of the facial nerve, but in that of the auriculo-temporal.

Campbell.

A Case of Bilateral Cerebral Disturbance of Hearing with Aphasia.

BOENNINGHAUS, Breslau (*Archives of Otology*, Vol. XXXV, No. 6). A man, aged 45, in the enjoyment of perfect health, while taking a walk, suddenly became totally deaf and lost the power of speech. In the absence of other symptoms of paralysis, a diagnosis was made of apoplexy of the hearing and speech centres.

In the following weeks speech improved and he could be understood, though with difficulty.

Hearing began to improve after two months; conversational voice, the winding of a watch and the clapping of hands are heard. The upper tone series is heard clearly but the lower tone series, on the right side below H and the left side below A, are not heard. Bone-conduction is lost. Notwithstanding this relatively good hearing, the patient does not understand anything. All sounds produce the same unintelligible noise.

As regards the disturbance of speech, the patient evidently suffers from sensory aphasia—that is, psychic deafness associated with paraphasia.

The seat of this disease is situated in the area of the left first temporal convolution. In man this is the centre of sound memories and the impulse passes from this point to the motor speech centre of Broca, in the left third frontal con-

volution, which in turn causes the speaking muscles to receive the proper innervation in order to perform their complicated functions.

The disturbance of hearing is thus explained. Seven years ago the patient suffered from a stroke of apoplexy. The left half of the body was completely paralyzed for two hours. A remnant of this paralysis persists in a slight drooping of the left angle of the mouth, and the left side of the body is more or less anesthetic. The lesion must have been in the internal capsule. The right auditory tract must have been completely destroyed, because this explains why, after the second apoplexy, the patient was totally deaf for two months. The partial reappearance of hearing is explained by the left temporal lobe recovering on the establishment of the collateral circulation.

The apoplectic lesion must to-day be limited to a part of the sensory speech centre and to a part of the rest of the left temporal lobe, which, just as the right, simply serves for purely physical hearing.

Campbell.

Report of a Case of Purulent Meningitis Following Radical Mastoid Operation—Recovery After Operative Interference.

HELD and KOPETZKY, New York (*Archives of Otology*, Vol. XXXV, No. 6). A little girl, aged 3, had a double chronic otitis media purulenta. A radical mastoid operation was performed on the right side, the tegmen antri was removed and an area of dura about one centimetre in diameter was uncovered. Nine weeks later dermatization was completed and the ear found absolutely dry.

Eleven months after the first operation the left ear was operated upon radically, the attic wall was necrotic and the tegmen over the entire antrum and aditus extending to the epitympanic space was absent.

For about 2 months she appeared to proceed slowly but steadily towards recovery. Then she became feverish, restless and vomited. The head was retracted, the pupils dilated and the right eye deviated slightly outwards.

On examining the wound, pulsations of the dura were absent and it was covered with thickly sprouting, dark-colored granulations.

Lumbar puncture was made, and the fluid found to contain pus and a large number of extracellular diplococci, having the appearance of pneumococci. Examination of the eyes showed double choked disk.

The diagnosis made was purulent otitic meningitis.

A hopeless prognosis was given, but it was decided to drain the interior of the dura. The left mastoid wound was curetted and enlarged. The lower portion of the squamosal plate of the temporal bone was removed, making an opening 3 by $3\frac{1}{2}$ c. m. The dark-colored, bulging dura was incised and there escaped 1 to 2 drachms of purulent fluid which bacteriologically showed a mixed infection with staphylococci predominating. The wound was flushed with a hot saline solution and a plain gauze drain introduced between the brain-base and the dura.

As this measure brought about no improvement, the left ventricle was entered and $1\frac{1}{2}$ drachms of purulent fluid removed, and by lumbar puncture, employed as a therapeutic measure, 40 c. c. of a grayish-white, turbid fluid withdrawn. Following this lumbar puncture a distinct improvement was noticeable, so two days later 30 c. c. of fluid were withdrawn, with still further improvement.

From this time on improvement progressed slowly and gradually. The intelligence cleared, the temperature gradually came to the normal, the rigidity of the spine and the retraction of the head disappeared. The eye fundus cleared, and although some trouble was experienced because of the protrusion of the brain substance through the dura into the mastoid wound, this was finally overcome by gradually increasing the pressure exerted by the external dressing and packing.

Campbell.

**A Case of Acute Sepsis Beginning on the Third Day of an Attack of
Acute Middle Ear Inflammation; Examination of the
Sigmoid Sinus; Recovery.**

DUNN, Richmond (*Archives of Otology*, Vol. XXXV, No. 6). A young man suffered from left-sided earache for three days, then had a severe chill with high temperature. Next morning his fever was gone, but it rose again that evening and had continued for three days when the author first saw him and found him in a semi-stupor. He was sweating profusely and complained of much pain in the left ear. There was no soreness over the mastoid nor over the jugulars. The M. T. was opened, but only serum and blood escaped. On opening the mastoid, fetid pus was found in the antrum. The sinus was bared and found normal. The temperature con-

tinued high. He complained of pain in his right side and there, two days later, symptoms of lobar pneumonia were detected. From this time on the course was that of an acute pneumonia.

Campbell.

On the So-Called Cyclic Course of Acute Otitis Media.

KOERNER (*Archives of Otology*, Vol. XXXV, No. 6). Zaufal claimed that a typical case of acute otitis media maintained a high temperature, lasting several days, with a subsequent sudden drop such as occurs in pneumonia. This the author has never observed, but in a few cases of otitis, with such a temperature curve, he has always discovered a more or less latent pneumonia. Preysing has called attention to the fact that pneumonia occurs with otitis very frequently in childhood and almost constantly in nurslings.

Koerner gives in detail the histories of three cases of otitis media in children with simultaneous pneumonia which at the beginning was latent.

Campbell.

The Differential Diagnosis in Otitic Sinus Thrombosis.

Voss, Riga (*Archives of Otology*, Vol. XXXV, No. 6). In the pronounced pyemic form of sinus thrombosis with enlargement of the spleen, malaria must be considered. In pyemia as well as septicemia the spleen is soft, whereas in malaria it is a hard, palpable organ. Occasionally, in case of a splenic infarct, one meets with a hard palpable spleen as a symptom of sinus thrombosis, and here one must exclude malaria by the absence of malarial organisms and the negative result of quinine treatment.

In septic endocarditis the same symptom complex is present as in sinus thrombosis, but examination of the eyes in the former condition reveals hemorrhages in the conjunctiva and retina. In cases of tuberculosis, pneumonia and typhoid fever, differential diagnosis must be made by the symptomatology and by examination of the blood and expectoration.

Campbell.

Some Remarks on the Radical Mastoid Operation for the Cure of Chronic Suppuration of the Middle Ear.

SEYMOUR OPPENHEIMER (*New York Medical Record*, March 16, 1907). After a careful review of the indications for the radical mastoid operation, which are those accepted by otolo-

gists in general, the author gives some of the possible results which may prove unsatisfactory to the patient, namely: the operation is not without danger even in the otherwise healthy individual, and is a trying surgical procedure, often incapacitating the individual for a long period of time. There is no surety that the hearing will improve following it, and even with the operation apparently carefully performed, a purulent discharge may still continue; owing to a progressive osteomyelitis, the facial nerve may be injured or the semicircular canal. There is also possible danger of injury or removal of the stapes and the exposing of the internal ear to the dangers of serious infection, but he does not regard all these as so great a danger as the presence of a continual focus of suppuration in the temporal bone. As to the important question of hearing, which strongly influences the action of the patient, where tests show that the hearing is already seriously impaired and the labyrinth is involved, nothing will be gained so far as the hearing is concerned by this operation, but where the inner ear is normal and the patient can hear ordinary conversation fairly well, the majority of cases operated on show no further impairment of auditory acuity, but rather an improvement. A small number of individuals will show a continued loss of hearing following the operation.

Richards.

Tuberculosis of the Middle Ear and Mastoid.

E. A. CROCKETT, Boston (*Journal of the A. M. A.*, Oct. 20, 1906), believes that no matter how severe the tuberculous infection, the bone lesion limits itself very easily and if the process is attacked wherever it may manifest itself, ultimate result may be obtained, provided the knife is resorted to freely and frequently and that the prognosis of tuberculous process in the neighborhood of the ear is fully as favorable in infants, if not more so, as the prognosis of the ordinary septic process commonly causing mastoid diseases in children. The usual auxiliary methods of treatment in use in tuberculosis in general are, of course, demanded. He thinks tuberculosis of the ear more common than has been generally reported, and that cultures taken with especial reference to the bacillus of tuberculosis as a routine measure in a large series of cases will show a large number of such infections, which clinically show no diagnostic symptoms.

Richards.

Influenza; Mastoid Abscess; Leptomeningitis; Nine Day Unconsciousness; Three Operations; Death.

H. BROOKER MILLS and NATHAN G. WARD, Philadelphia (*Medical Record*, March 9, 1907). In this case there was an attack of influenza followed by mastoid abscess, suppuration and necrosis in the ethmoid; relief of the symptoms except headache after operation; sudden development of violent pain in the head, with unconsciousness for nine days, high remittent temperature, meningitis, pus in the cerebral ventricles, death. The autopsy showed purulent leptomeningitis with ventricles widely distended with thick, greenish pus. *Richards.*

The Clinical Value of the Differential Blood Count in Operative Otology.

JAS. F. MCKERNON (*N. Y. Medical Journal*, January 19th, 1907) bases his observations on a study of 166 cases, of whom 108 were adults. After analyzing these cases, he reached the following conclusions:

The conclusions arrived at by a study of these cases are that in septic cases, and particularly when distinct symptoms and physical signs are absent, the differential blood count is of practical value in enabling us to complete a diagnosis, and in cases of sepsis, when the physical signs and symptoms are distinct and definite, it is then only confirmatory of what is already present, and gives us an added link to complete the chain of evidence.

In doubtful cases, when a differential count is taken and found to be negative, other daily counts should be taken, in order to verify or disprove that which has formerly been taken. Another fact of importance brought out in this series of cases is that when cellular bone structures, like the mastoid bone, are involved in a septic inflammation, without involvement of the adjacent blood currents, we find that in the majority of cases the differential count shows a relatively lower polynuclear percentage than when a septic process is present in the soft tissues of the body. This can be explained on the theory that an absorption of toxins is less rapid when such a process takes place in a bone cavity, than when the soft tissues of the body are involved, for in a number of the cases operated on, an abundance of pus was found, when the count showed a polynuclear percentage of between 72 and 80.

Harris.

Otology in Its Relation to the General Practitioner.

GORHAM BACON (*N. Y. Medical Journal*, December 22nd, 1906). In Bacon's opinion, the most serious cases among children are those that have little, if any, pain but whose chief condition is high temperature. He calls attention to the probability, in cases of scarlet fever and measles, that sudden rise of temperature is due to an extension to the diseased ear. In his experience, mastoiditis is not as serious a complication in scarlet fever as with measles. He has seen several serious cases following measles. Here, an osteomyelitis has developed which is almost certain to be followed by meningitis. He attaches great importance to the character of the micro-organism found in the ear pus and lays weight also on the value of the blood-count. In regard to chronic otorrhea, he takes a conservative view and does not think it necessary to operate radically in all cases, referring to one case where such an operation had been advised but had been cured after removing the granulations by using the syringe. In his opinion, the percentage of fatal cases of chronic otorrhea among private patients is very small, and he has had but one case, viz., a brain abscess, during his entire practice. It is from the hospital cases that the statistics are compiled, and we all know how the poor neglect treatment unless compelled to come on account of pain, foul smelling discharge and dizziness. In chronic otorrhea the surgeon should, in his judgment, distinguish between the operative and non-operative cases, and he should never unnecessarily alarm the patient by advising an immediate operation, until he has made a through examination and satisfied himself that the case is an urgent one, and cannot be cured by conservative methods.

The Treatment of Chronic Suppuration of the Middle Ear.

EDWARD BRADFORD DENCH (*N. Y. Medical Journal*, May 4th, 1907) believes that when granulation tissue returns immediately after removal followed by proper irrigation there is diseased bone behind it and mild measures of treatment will prove useless. He does not attach any value to applications to the mucous membrane. He calls attention to the danger of recurring attacks in chronic middle ear suppuration because of the possible grave conditions behind it. Although a strong advocate of ossiculectomy, having had as high as 75 per cent of cures, he has now abandoned the operation on the grounds

that the conditions met with, even in mild cases operated on, are frequently so much more extensive than one would think. He describes the technic which he employs in the radical operation. He is a strong advocate of the skin graft, believing in a primary grafting when possible. With his improved technic he secured over 85 per cent of cures, with only three secondary operations, out of a series of 250 cases. He does not attach any importance to the possibility of fatal results following the operation, believing they are due to conditions existing before the operation. In his series of cases, the hearing has been made worse in only a few instances, and in the others it has remained the same as before the operation, or has been improved.

Harris.

II. — NOSE.

A Statistical Report of the Results of Operations in Sarcoma of the Nose by Methods Generally Adopted, with a Plea for the More Extended Use of the Electro-Cautery in Suitable Cases.

J. PRICE-BROWN, Toronto (*Canadian Practitioner and Review*, 1906), has collected the statistics from fifty-one operations on sarcoma of the nose, with 14 recoveries, or 27 per cent.

His own cases consist of four patients with intranasal sarcoma, ages respectively eighteen, twenty, fifty and fifty-eight years, all of them operated upon with the galvano-cautery intranasally. Three of them are still living, having been operated on, respectively, eleven years, three years, and four years previously. The fourth case died of septic infection, probably from absorption of ptomaines from the sarcoma, but death did not occur until some time after the apparent removal of all of the growth.

The method consists in the free use of cocain and adrenalin, producing as much anemia as possible, then making perpendicular incision with the electro-cautery knife at a high degree of temperature, down into the basal attachment of the growth so far as possible. At the next visit, one or two days later, the cauterized tissue is removed by snare or forceps, the parts cleansed by sprays, and the operation repeated. Thus, successively, piece by piece and day by day, with the electro-cautery blade at almost a white heat, the sarcomatous tissue is dissected away. He thinks that in many of these cases a

cure can be accomplished by thorough and careful and pain-taking treatment; and that even in cases usually considered inoperable, great and beneficial relief can be secured to the patient by the same means. *Richards.*

Osteomata of the Frontal Sinus.

GERBER (*Archives Internationales de Laryngologie*, January, 1907). Osteomata resembles fibromata of the nasopharynx in that they are at once benign and malignant. Histologically, they are benign. Osteomata are comparatively rare. Gerber has collected records of 84 cases. He regards, in cases of doubt as to the diagnosis, a pushing of the eyeball forward, outward, and downward as pathognomonic of all tumors of the frontal sinus, whatever their nature. When the eyeball is pushed forward only, it points to a tumor of the sphenoid or orbit; protusion outward, a tumor of the ethmoid.

The etiology of these tumors is obscure. Two theories are usually held—traumatism or some embryonic defect. After considering the arguments in favor of both of these theories, the author insists, in spite of attempted histologic differences:

First, that osteophytes, exostoses, and osteomata, all spring from the bone or periosteum without our being able to establish a difference between them.

Second, that osteophytes and exostoses of the frontal sinus are not rare.

Third, that otitis and periostitis of the frontal sinus are not rare.

He further observes that, in spite of assertions to the contrary, multiple osteomata are met with, and, further, as a proof against the embryonic development i. e., that these two must always proceed from the ethmoid—that in eight cases at least, they had nothing to do with the ethmoid, and that in numerous cases where the tumor did arise from the ethmoid, it could have arisen as easily from the periosteum as from the cartilage. As regards the etiology, he concludes as follows:

First, that the frontal sinuses have, more than any other part of the osseous system, a marked tendency to be the seat of bony tumors.

Second, that the majority of the time these are small circumscribed exostoses, osteophytes or hyperostoses which exist unrecognized throughout life.

Third, that at times we meet with osteomata of more considerable size, usually single, rarely multiple, which become dangerous by the compression which they exercise upon the orbit and contents of the skull.

Fourth, that they are wont to produce their maximum of intensity during the stage of formation of the bone and during the development of the frontal sinuses. That is why we observe them most often between the ages of ten and thirty.

Fifth, that the masculine sex is more often attacked.

Sixth, that the development of the tumor does not always extend over from year to year.

Seventh, that under proper operative procedure the prognosis is favorable.

The author concludes by reporting two cases of his own.

Harris.

A Contribution to the Study of the Etiology of Nasal Obstruction.

ROTH (*Revue Hebdomadaire*, January 20th, 1906) describes a group of cases where the only symptom complained of is pain in the superior maxilla bone. All that would suggest an inflammation in the nose, such as secretion or swelling, is lacking. Only by means of the exploratory puncture of the antrum is it discovered that there is disease in the antrum, the syringe bringing away a thick secretion which the patient was unable to blow away. He believes that in all cases of obstructed breathing, where no cause can be discovered in the nose or throat, the antrum should be explored. This inflammation of the antrum, which is of a catarrhal nature, can produce a unilateral nasal obstruction which is in the nature of a swelling of the cavernous tissue of the turbinals. This latter condition Roth has recently seen in three cases. This at once cleared upon washing out the antrum. He thinks that the swelling is here of a reflex nature.

Harris.

Some Mental Symptoms Due to Disease of Nasal Accessory Sinuses.

J. A. STUCKY, Lexington, Ky. (*Medical Record*, Nov. 24, 1906), reports eleven cases of nasal accessory sinus trouble in which the mental symptoms were marked, the ethmoid cells having been involved in all of the cases. The paper is a contribution to rapidly increasing literature of ethmoid trouble,

the appreciation of which and the treatment for which will result in the cure of many obscure cerebral conditions.

Richards.

Remarks on Endonasal Surgery.

A. B. THRASHER, Cincinnati (*The Lancet-Clinic*, April 13, 1907), regards the lower turbinate as standing as a protecting sentinel at the gateway to the lungs, and not to be sacrificed except as an urgent necessity.

Richards.

Further Studies in Nasal Therapeutics.

JOHN A. THOMPSON, Cincinnati (*Lancet-Clinic*, March 23, 1907). Eczema in the vestibule of the nose is treated with an ointment containing a dram each of borax and boric acid in an ounce of vaseline. This so softens the crusts that they can be removed without pain or bleeding.

Purulent rhinitis of children is treated with the same remedy, used liberally in the nose at bed-time, applied when the child is lying down. Stearate of zinc and subgallate are indicated as protective powders after operations.

Richards.

A Case of Rhinoscleroma Treated with the X-Ray.

MILTON J. BALLIN (*N. Y. Medical Journal*, March 16th, 1907) speaks briefly of the etiology of the disease, referring to the fact that Frisch in 1882 discovered a bacillus which he regarded as the causative factor. It occurs chiefly among the Russians, especially those in Galicia, and it is not contagious. It develops in both sexes. Up to the present time, the prognosis has been very unsatisfactory. His patient was a woman of fifty-three years and a Russian. The disease had lasted for sixteen years. Ulcerations of the pillars of the pharynx had been followed by large linear cicatrices. The uvula had disappeared. The microscope confirmed the clinical diagnosis. For four years she had been having pronounced tumefaction of the nose. The nasal passages were entirely occluded. The X-Ray, employed for a period of five months, had worked a most pronounced change, the nose being reduced almost to its normal size. The treatment was carried out with short exposures, but with currents of high frequencies—three sittings a week—a period of three to four minutes. There has been

no improvement in the nasal respiration. The larynx was not involved. At the same time that the author's case was presented, a similar case also favorably treated by the X-Ray was shown.
Harris.

The Radical Operation for Empyema of the Antrum of Highmore.

L. RETHI (*N. Y. Medical Journal*, February 9th, 1907) claims precedence for performing the intra-nasal operation in disease of the antrum of Highmore, referring to the fact that he described the operation in 1901. His operation is different from Claoue's in that Claoue's operation is in the inferior meatus, while he opens both in the inferior and the middle. He believes in a large opening, as otherwise there would be in his judgment trouble through closing in after-treatment. He removes the anterior two-thirds of the interior turbinated at the time of the operation and the external wall with a chisel pressed upon by the hand. The operation is rendered painless by the use of cocain, and he rarely is compelled to resort to general anesthesia. He states that he takes not more than fifteen minutes for the entire proceeding. He reports thirty-two cures out of thirty-eight cases operated upon.

Harris.

III.—MOUTH AND PHARYNX.

Diseases of the Nasopharynx in Infancy.

JOHN L. MORSE, Boston, Mass. (*Boston Medical and Surgical Journal*, April 18, 1907). This is a most valuable review of the diseases of the nasopharynx in infancy, from the standpoint of the pediatricist.

The nose is relatively small and the respiratory portion very small. The height of the posterior nares at birth is from 6 to 7 mm., and the breadth between the pterygoid processes at the hard palate 9 mm. The nasal cavity is relatively long and shallow, and the respiratory portion is very narrow, the whole opening of the posterior nares on either side being just large enough to admit the end of a medium-sized male catheter. After birth the cavity increases in height directly, rapidly during the first six months but slowly during the rest of infancy. The size of the posterior opening doubles in six months, after which it remains stationary until the end of the second year.

At the end of the seventh month the nasal cavity begins to approach the adult shape, although still relatively broad. The nasopharynx is very low at birth, but relatively long from before backward, the distance from the hard palate to the soft parts at the back of the pharynx being nearly as great at birth as in the adult. The soft palate is placed more horizontally than in the adult.

The Eustachian tube is nearly horizontal at birth, but slants a little during the latter part of infancy. The tube is not only relatively but absolutely wider at its narrowest point at birth and during infancy than in the adult, which explains the ease with which catarrhal processes travel to the middle ear in infancy.

The connective tissue between the pharynx and the spine is very lax. The nasopharynx is extremely vascular, and there is an abundant supply of lymphatic glands and vessels, especially in the posterior wall. Retropharyngeal lymph nodes form a chain on both sides of the median line of the pharynx, extending from its upper portion to its junction with the esophagus. They lie between the prevertebral aponeurosis and the muscles of the pharynx. The lymphoid ring is often well developed at birth and even more so during infancy.

Acute rhinitis, or the common cold, is very common in infants, and is sometimes a fatal malady, especially in the early months, the symptoms being broken sleep, oral respiration, elevated temperature, often very high, loss of weight and strength. The treatment is local and general, the latter being merely supportive. Liquid albolene or albolene combined with menthol and camphor in the proportion of one grain of each to the ounce is the most useful local application. It is best introduced with a dropper, with the infant on its back. He regards acute rhinitis as contagious, hence babies should be kept away from adults and older children suffering from colds.

He has found diphtheritic rhinitis rather common in children, and at the Boston Infants' Hospital every nasal discharge in an infant, if irritating, is suspected of being diphtheritic, so that as a routine all babies now receive 50 units of antitoxin on admission and every three weeks afterwards. This has been practiced for six years, since which time but one case of pharyngeal diphtheria has developed in the patients in the hospital, although many unimmunized nurses and nursery maids have come down with it and many cases of diphtheria have

been discovered. A thin, watery nasal discharge which irritates the lip, should in an infant always be regarded with great suspicion and the discharge be examined bacteriologically. The membrane is very hard to find, and unless the speculum is used is never visible and even then may not be seen. The diphtheritic process does not extend downward and backward to the pharynx and larynx. Alkaline washes are used, introduced with a dropper or syringe. Strong antiseptic solutions should not be used.

Adenoids: These are far more common in young infants than the general practitioners or even the laryngologists have supposed, and the evil results which they produce are greater in infancy than in childhood. He has found a general feeling, even among laryngologists, that adenoids should not be removed in infancy because they are likely to recur later. With this feeling the author entirely dissents, for the reason that in the majority of cases the adenoids do not recur, and even if they do, there is no reason why the baby should be subjected during the interval to all the evils which adenoids produce when they might be avoided by early operation. On account of the small size of the superior pharynx and postnasal opening even a small amount of adenoid can cause marked obstruction in nasal respiration.

Rickets is especially prone to develop in these cases, and considerable deformities of the chest are sometimes produced. A series of cases are cited showing the results of adenoids in infants and the improvement after removal. They are one of the commonest, if not the most common, cause of chronic "snuffles" in infancy. They are always present in those babies that are subject to frequent colds in the head. The fact that the baby does not keep its mouth open or snore at night or have the typical facies of adenoid in later childhood should not allow one to overlook the adenoid symptoms, but be on the lookout for them when they are present, since the frequent colds and chronic snuffles are almost as suggestive and characteristic of adenoids in infancy as these more marked symptoms are in childhood. Adenoids should also always be thought of when babies sleep poorly.

Pharyngitis is common in infants. Glycerite of tannin applied locally is found to do more good than anything else, drugs internally having proved useless.

Retropharyngeal abscess is often overlooked and can only be diagnosed in the early stages by palpation. No examina-

tion of an infant's pharynx should be considered complete until the area has been palpated with the finger. Unwillingness to take food, difficulty in swallowing, difficult breathing except in the upright position, laryngeal cries, stridulous respiration, high temperature, are the characteristic symptoms. These symptoms are, however, frequently misinterpreted, since the condition is not considered even in the differential diagnosis. When the diagnosis is made incision should be performed with the infant in the upright position, with a guarded knife. A gag should not be employed because of the danger of sudden death from its use. (The author does not mention the question of anesthesia, but as several deaths are on record from the use of anesthetics in retropharyngeal abscess, the reviewer thinks anesthesia should never be used for the same reason that the mouth gag should not be, namely: on account of the danger of some disturbance of the vagus from the effects of the anesthetic or the pressure of the mouth gag.) The incision should be made in the mouth and not externally, and enlarged with the finger.

Otitis media. He has found this very frequent in infancy and often overlooked on account of the general misapprehension as to the symptomatology of the disease at this age. Physicians are constantly on the lookout for earache and tenderness over the mastoid, and when these are not present, rule out trouble in the ear without further investigation. Many infants with acute inflammation of the middle ear show no sign of pain at any time, and many others who evidently have pain somewhere, show nothing by their actions that attracts the attention of the physician to their ears. Babies with earache rarely put their hands to their ears. The symptoms of earache are sharp cries, restlessness and inability to sleep. Tenderness over the mastoid on pressure is a very unreliable guide. On account of the undeveloped condition of mastoid cells, mastoid inflammation is rare in infancy. In most of the cases of otitis media there are no symptoms which attract direct attention to the middle ear. High fever is usually an accompaniment, though not always. Infants with fever and obscure symptoms should always be examined as to the condition of the middle ear and drum membrane. A series of cases showing various types of otitis media in infancy are given, in several of which the symptoms were unusual and misleading, all pointing to some obscure cerebral condition,

either acute or chronic, in which mistakes in diagnosis were made by several competent gentlemen, but in which all the symptoms disappeared after incision of the drum membrane.

The author thinks the ear should be examined in every acute illness in infancy, and every practitioner should become conversant in the examination. A smaller speculum than comes in most sets is necessary. The importance of the patency of the petrosquamosal suture in infancy as favoring the extension of inflammation from the middle ear to the meninges has been much overestimated, and can to all intents and purposes be disregarded.

Richards.

The Diseased Faucial Tonsil as a Causative Factor in Respiratory and Gastric Diseases.

DR. SOLENBERGER (*New York Medical Journal*, September 15, 1905). A further contribution to the voluminous literature on this important subject. The writer is an ardent believer in the far-reaching evils from the so-called tonsil. He does not recommend the cold wire snare for their removal, because of the difficulty of application and incompleteness of the result. In his opinion cutting instruments, such as scissors, are accountable always for hemorrhage, and on this account are never to be employed. His preference is for the tonsil punch, which, if properly constructed, as are the Myles or Freeman punches, will give most satisfactory results.

Harris.

The Relation Between Disease of the Tonsils and Enlargement of Glands of the Neck.

CAMPBELL (*New York Medical Journal*, May 1st, 1907). After referring to the anatomic structure of the tonsils, the author gives a resumé of the recent investigations on the lymphatic system of the neck. In acute infectious diseases, the glands enlarge some days before the onset of active symptoms and, in his judgment, are reliable indications that such diseases are incubating. Nursing infants are not prone to contract infectious diseases, due probably to the small size and active conditions of the tonsil. The apparently healthy tonsil does not prevent the passage of virulent tubercle bacilli through its substance. He quotes Bandelier, who has summarized the principal communications regarding the tonsil in tuber-

culosis, giving details of 100 cases where the tonsils were enlarged and tubercular among 900 patients suffering from general tuberculosis. The tonsils of the adult are seldom the entrance point of tubercular infection. He concludes by saying it would be well were the truth more generally recognized that diseased tonsils are in themselves not only perilous to the individual, but a great menace to the glands and contiguous parts which are so very susceptible to disease. If tonsils and adenoids were more often removed, infectious diseases, including tuberculosis, would be more infrequent.

Harris.

Acute Edema of the Pharynx, with Report of a Case Requiring Rapid Tracheotomy.

GOETHE LINK, Indianapolis (*Medical Record*, March 2, 1907), reports a case of severe edema of the pharynx accompanying tonsillitis, in which an emergency tracheotomy was done, and in the absence of any tube other than a silver female catheter and a hard rubber vaginal syringe, he used the former for an emergency tube at the time of the operation and then used the hard rubber vaginal syringe tip, previously whittled to fit the tracheal wound, for the permanent breathing. The edema rapidly subsided and recovery promptly occurred.

Richards.

IV.—LARYNX, TRACHEA AND ESOPHAGUS.

Primary Laryngeal Tuberculosis.

MANASSE (*Fraenkel's Archiv.*, Bd. XIX, Heft 11, 1907). According to Schech, laryngeal tuberculosis, in rare instances, may occur primarily, without previous or existing tuberculous disease of other organs. Both Chiari and Schech, however, have been able to find only four cases of primary tuberculosis of the larynx based on autopsy findings.

The author reports another case: Mrs. M., aged 55 years, developed pain in the throat four weeks before coming under the author's observation. Dyspnea had been present for eight days. On examining the larynx, the mucous membrane was found to be reddened, with some infiltration of the vocal cords and ventricular bands. During quiet respiration, a subglottic swelling of the tracheal mucous membrane could be

seen, which occluded the lumen of the trachea very much. The vocal cords approximated perfectly. The dyspnea increased to such an extent that tracheotomy had to be performed, after which breathing became easy. Patient died suddenly a week after the operation. The autopsy showed a fibrinous coating of both lungs and a cloudy exudate in the left pleural cavity. The mucous membrane of the bronchial tubes was extremely reddened, but free from cicatrices and ulcers. The small bronchi were considerably dilated and contained a thin purulent secretion. No old tuberculous lesions were found in the lungs. Microscopical evidence of tuberculosis was found in the larynx. There was a circumscribed tuberculous process of the lower half of the right vocal cord, with perichondritis of the cricoarytenoid articulation. The case was of interest because the autopsy proved that all other parts of the body were free from tuberculous changes, so that this must be considered a case of primary tuberculosis of the larynx.

Theisen.

Tracheal Diphtheria with Recurring Formation of Pseudo-Membrane.

H. HERZOG (*Deutsch Medicinische Wochenschrift*, May 16, 1907) had occasion to observe three times in a severe case of diphtheria an "ecouvillonnage" of the larynx.

In 1896 Variot and Bayeux, described under the term "ecouvillonnage" a new procedure in the treatment of laryngeal diphtheria.

The method consists in the passing of the tube, just as in the ordinary intubation. The tube which loosens the membrane clinging to the walls of the larynx and trachea, is removed in a few minutes, however, and the detached membrane is coughed out.

In the following case, described by the author, the patient coughed out the tube with a membranous cast of the trachea three times.

J. B., aged 2¾ years. Had measles four weeks before coming under the author's observation. Coryza and a hoarse cough for a week with suffocative attacks for several nights. On examination, an extensive membrane was observed on both tonsils. The nose was clear. Intubation was performed within a half hour after the patient was admitted to the hospital. The tube could be easily introduced, but was coughed

out after a few seconds, covered with a membrane which covered it like the finger of a glove.

The membrane showed the impressions of the tracheal rings.

Ten hours after the first intubation, urgent symptoms demanded a second one. The tube was again coughed out at once, and was covered with the same kind of membrane.

Fourteen hours later another intubation had to be performed and the same thing happened. The same tube-like membrane was coughed out.

The further history of the case is of no great interest. The patient made a complete recovery.

The use of antitoxin did not prevent the regeneration of the membrane in the trachea which occurred twice in twenty-five hours, but the ease with which the membrane was thrown out was undoubtedly due to the action of the serum.

Theisen.

Thyrotomy and Laryngectomy for Malignant Disease of the Larynx.

CHEVALIER, JACKSON (*British Medical Journal*, Nov. 24, 1906) has performed fifteen thyrotomies for malignant disease of the larynx. The age of the patients varied from 33 to 81 years. All of the fifteen cases were males.

Site.—Left ventricle in three cases; right ventricle in two; left ventricular band in one; right band and ventricle in one; left cord in one; left cord and ventricle in one; right cord in three; both cords (anterior commissure), in one; interarytenoid fold in one; aryepiglottic fold in one.

All of the growths were small in size, the largest not much exceeding a cubic centimetre, and the smallest rather smaller than a pea. Histologically, twelve were squamous-celled epitheliomata, one was scirrhous, one glandular-celled carcinoma, one sarcoma.

Recurrence.—Of fifteen thyrotomies for malignant disease performed by the author, one is too recent for record. Of the remaining fourteen, one was alive and well at the end of six years, one at the end of four years, two were alive and well at the end of three years, one at the end of two years. Two died of general diseases after one year, 4 were lost trace of at the end of about one year, and 3 died of local recurrence in spite of subsequent laryngectomy. Of the 14 thyrotomy cases, 11 or 78 per cent, were well at the end of one year, at which period the author believes the term relative cure may be applied.

In considering the subject of total extirpation of the larynx, for malignant disease, the author states, that while thyrotomy is the operation of election for early intrinsic malignant disease, laryngectomy should be performed in certain selected cases of extrinsic cancer, if the patient's general condition warrants it. Out of 29 cases of extrinsic malignant disease of the larynx observed by the author, total laryngectomy was done in eight. These eight patients were in good physical condition. The age ranged from 52 to 75 years. All eight cases were males. Of the eight cases, six were epitheliomata, one was a columnar-celled carcinoma, and one of mixed type—an endothelial sarcoma.

Site.—Aryepiglottic fold in 1; aryepiglottic fold, epiglottis and arytenoid in 1; interarytenoid fold and posterior surface of the cricoid in 1; right half of the larynx in 2; left half of the larynx in 2; posterior half of the larynx in 1.

Recurrence.—Of the eight total laryngectomies performed by Jackson, three were hemilaryngectomies followed by recurrence and the total operation. Of the eight laryngectomies, one lived 7 years, one lived 3 years without recurrence, dying of cerebral hemorrhage, and one eight months, dying of alcoholism. Of the remaining five, three recurred within a year, one apparent cure was lost to observation after a year, and one is too recent to record. One of the three prompt recurrences had metastases in the lungs, liver and pancreas. Thus, of eight laryngectomies, no absolute ultimate cures can be claimed, though three were apparent cures at the end of one year.

The author then considers the technic of the operation and concludes as follows:

1. Thyrotomy is the operation of election for early intrinsic laryngeal malignant disease. Until a therapeutic cure shall have been discovered, surgery cannot hope for better results than this operation yields, if done only in intrinsic disease of very limited extent.

2. Laryngectomy is advisable in all cases extrinsic by origin or extension, provided the patient is in vigorous health.

3. There is no such thing as absolute ultimate cure of malignancy. Recurrence may take place after many years. For the purpose of comparing the relative efficiency of operative methods, freedom from recurrence for one year indicates adequate removal. Varying periods thereafter indicate vary-

ing degrees of malignancy or varying degrees of vulnerability; not repullulation of the primary process from operative inefficacy. If cancer can reappear in the stomach seven years after removal of the cancer of the larynx, there is no reason why it should not appear in the neck of the scar, where it would be called a "recurrence" rather than a "reinfection."

4. No operation other than a palliative one is justifiable in a patient of feeble general health, nor in one in good condition if he have metastasis or organic disease. Hence, in only a few cases is operation justifiable at the time they come under observation.

5. If this rule be adhered to in the selection of the case, and a careful technic, preoperative and postoperative as well as operative, the mortality of laryngectomy can be reduced to a point where any surgeon will not hesitate to advise it. The mortality must always be considerable. It is not possible to reduce it to *nil*, and it is only so in this series by reason of the small number of cases.

Theisen.

Scleroma of the Larynx.

EMIL MAYER, New York (*American Journal of the Medical Sciences*, May, 1907), thinks this case is the first case of scleroma beginning *de novo* in the larynx to be presented and published in North America.

The patient was a Slav from Poland, 15 years of age, female, and well until three years ago. Became hoarse on the journey from Poland to America. The mass was subglottic below the right cord, protruding into the larynx, diminishing its lumen by about one-half, and had a grayish appearance. In the removal the masses were translucent, pale and resembling soft adenoid tissue. The pathological report was that of scleroma, and pure cultures of a mucoid, Gram-negative, capsulated bacillus, belonging to the Friedländer group were obtained from the freshly cut sterilized surfaces of the growth.

A study of the literature is given, and the conclusion reads that scleroma is a chronic, incurable affection, contagious to a certain degree.

Richards.

V. — MISCELLANEOUS.

The Physiology of Language and Its Relation to the Treatment of Stammering.

HUDSON MAKUEN (*New York Medical Journal*, December 29th, 1906) refers to the way that the subject of defects of speech has been neglected by regular teachers and practitioners of medicine. Its treatment in his opinion belongs to the laryngologists although he recognizes the neurological element. The nomenclature of defect of speech is in great need of revision. He defines stammering as a more or less constant inability to speak freely owing to an incoordinate and spasmodic action of the respiratory, phonatory, or articulatory muscles. He dwells on the prevalence of the affection; one per cent of all school children are affected and he explains the comparative absence in adult life, being due to either the death or dropping behind of its victims. Just as the English alphabet has 26 characters, so spoken language has its own alphabet of sound called the physiologic alphabet. Several such alphabets have been constructed, and the author gives one of his own. In his opinion, the use of such an alphabet constitutes the basis for the proper phonatory and articulatory treatment of stammering, and with it, the patient is taught to speak in exactly the same way as he was taught to read. This method should be pursued for several weeks to the exclusion of ordinary conversation. It does not develop a formal or stilted style of speech, as has-sometimes been supposed. *Harris.*

The Treatment of Tuberculous Glands of the Neck by the X-Ray.

SIDNEY L. FELDSTEIN (*N. Y. Medical Journal*, January 5th, 1907), from a considerable experience, makes the following conclusions as to the value of the X-Ray in the treatment of the glands of the neck:

First, they should be treated by the X-Ray when no softening or caseation has taken place.

Second, softened or caseous glands should be referred to the surgeon, and ought not to have X-Ray treatment.

Third, postoperative X-Ray treatment is important if there is any doubt of remaining glands which might be infected.

Fourth, for cosmetic reasons.

Fifth, the size of the gland or glands does not influence the successful result of the treatment. *Harris.*



ANNALS
OF
OTOLOGY, RHINOLOGY
AND
LARYNGOLOGY.

VOL. XVI.

SEPTEMBER, 1907.

No. 3.

XXXVIII.

ETIOLOGY OF ERYSIPELAS.

ITS RELATION TO THE NASAL CAVITIES AND ITS DESTRUCTIVE
EFFECTS UPON THE EYE.

BY C. R. HOLMES, M. D.,

CINCINNATI, O.

Erysipelas is treated of systematically in works on General Medicine, General Surgery and Dermatology. It is an important and serious disease and merits the attention which these authors give it. Although a germ disease it still prevails extensively in this latter era of asepsis and antisepsis, invading the best equipped and best managed hospitals, and the cleanest and most elegant private houses, and even occurs spontaneously and without apparent cause in absolutely new hospitals. If you will read the paragraphs that treat of the etiology of this disease in the works that I have referred to, you will see that there is some important thing in its causation that is unexplained or that an assumption is made that is not borne out by the facts as they are available to us today. The word "idiopathic"—now almost obsolete in every depart-

ment of medicine—still appears in their pages. They feel the necessity of apologizing for this word, however, and explain that this must be taken to mean that the specific germ, introduced from without, gains entrance to the body through a wound so slight as to have been unnoticed or so transient as to have been healed and invisible before the onset of the erysipelas. In short, the implication almost invariably contained in their articles is that the infection, the identity of which has now been established for many years, is brought mysteriously to the patient from without—either air borne through the infected atmosphere of a hospital ward, or on the hands or instruments or clothing of the surgeon. In many instances—indeed, in a great many instances—this explanation is appealed to because no other is within the knowledge of the authors—but recent studies have brought me to the conclusion that there is a vast mass of literature bearing upon this very mystery that it is now time to bring together and lay before the general physician and surgeon and dermatologist, that they may be enabled to penetrate the mystery and advise their students of the most important source of the erysipelatous infection, so that an attempt at prophylaxis will deliver into the hands of the rhinologist and aurist a class of cases that we, unfortunately, too often see only after serious damage is imminent or has already been done. I am referring to the literature of Rhinology, Otology and Ophthalmology. These special branches are not often carefully studied by the writers on the general subjects already referred to and that they should have missed the significant articles scattered through the magazines of five languages—especially when the American literature contains but scanty reference to the matter—is not to be wondered at.

That we may forge an absolutely complete chain of evidence; I beg that you will allow me to take it up, link by link; and therefore we must establish, first, what erysipelas really is.

Erysipelas is an acute, infectious, contagious disease, evidencing itself by a characteristic inflammation of the skin and mucous membrane and occasionally the subcutaneous tissues, with a tendency to spread by continuity of tissue, and with systemic disturbances varying from very mild to very profound. It undoubtedly has a tendency to spontaneous recovery even in severe cases.

The exciting cause of erysipelas is a streptococcus—indeed we may now say the streptococcus. “Streptococci are most frequently encountered in their parasitic abode.” Though capable of existing for a short time outside of the animal body, their slow growth on culture media and their short lives, point to direct transference from body to body. Although these characteristics are not absolutely uniform, I beg you to observe that they militate strongly against the idea that erysipelas is an air borne disease, and on this important point I will submit to you further evidence presently.

Streptococci are subject to many variations in form. They appear as diplococci, in chains of from four to six smaller cocci, and in longer chains with both large and small segments. There is no apparent specific difference between streptococcus longus, streptococcus brevis, streptococcus conglomeratus, streptococcus gracilis and streptococcus involutus, since comparatively slight changes in culture media or a sojourn in an animal organism (and this is a very important point in our study of this subject) can change the morphologic characters of the organism. The rate of growth on artificial media differs in streptococci from different sources, but all are of comparatively slow growth. The virulence of streptococci from different sources also differs most markedly, not only in transferring the cocci from animals of one race to those of another, but in transferring from animal to animal of the same race. In other words, environment, the culture medium employed, may increase or decrease the virulence of the germ and its toxins. Streptococci are pus producers. They may be associated with all stages of pyogenic infection from local inflammation to general septicemia. They are encountered in inflammations of all mucous and serous membranes, in bones and in such organs as the liver and the brain. Among other infections they are found either alone or combined with other organisms in spreading phlegmon and cellulitis, anginas, lobular pneumonia, synovitis and osteomyelitis, lymphangitis, pleuritis, peritonitis and periperal septicæmia. It was formerly thought that the streptococcus of Fehleisen (streptococcus erysipelatis) was specifically different from those concerned in other inflammations. For instance, John Collins Warren (71), writing on erysipelas in 1894, said “Fehleisen concludes, from his observations, that the erysipelas coccus is a specific microbe which will always reproduce the disease when inoculated even in

the smallest quantities. . . . The question of the identity of the erysipelas coccus with the streptococcus pyogenes has frequently been raised and authorities are not yet entirely agreed upon this point. The coccus of erysipelas is larger than the streptococcus. . . . Many modern observers concede that the erysipelas coccus causes not only erysipelas, but also abscess, but many others believe that when suppuration occurs, it is due to pyogenic cocci which have become inoculated secondarily, and that suppuration is therefore merely a complication of the disease. Experimental inoculation with erysipelas cocci has, in the hands of one observer, always produced erysipelas, while inoculations with the streptococcus produced phlegmonous inflammation."

Since this was written, however, it has been satisfactorily demonstrated that the streptococcus of erysipelas may become pyogenic and the streptococcus pyogenes may produce a characteristic erysipelatous inflammation of the skin, and we find one of the standard textbooks of the day on pathology (58) declaring that "the conditions which they induce depend upon the route by which they gain access to the body, and especially upon their virulence which may be exalted to an extraordinary degree by certain conditions of cultivation and passage through animals. In short, it has been shown that the activity of a streptococcus, which only causes abscess, may be exalted to a virulence by which erysipelas, purulent infiltration or fatal septicemia results. These experiments serve to sustain the views as to the common ancestry and close relationship of the various streptococci as indicated by morphologic and physiologic considerations, and to emphasize the desirability of considering them as a single group. Besides their more active manifestations streptococci may lie latent." One of the most important studies that led to the setting forth of this modern dictum was that of Fraenkel (72) who reported to the Hamburg Society of Physicians that from the pus contained in abscesses that had developed in the course of an attack of erysipelas, he had been able to cultivate an organism that corresponded to the streptococcus erysipelatis. He had also observed a case in which the development of facial erysipelas was ascribed to infection from a felon in the pus of which streptococci were found. In a case of extensive facial erysipelas, there was also suppuration of the subcutaneous tissues of the greatly swollen eyelids and of the inter-

muscular and intramuscular tissues of the neck. In the pus and in the edematous fluid streptococci were found microscopically and by culture. In experimental results it appeared that the streptococcus produced at one time lymphangitis or a phlegmon, at another erysipelas or peritonitis. He had succeeded in inducing erysipelas by injections of streptococcus pyogenes into the ears of rabbits, and he had also occasioned suppuration and peritonitis by inoculation of erysipelas cultures. Nor were the results confined to one species of animal.

Prof. William H. Welch, Johns Hopkins University, Baltimore, in his reply to a recent communication from me requesting his opinion, says: "Streptococcus erysipelatis (Fehleisen) cannot be distinguished by any properties morphologic, cultural, pathogenic, from streptococcus pyogenes, and practically all authorities in bacteriology consider the two identical. Attempts to subdivide into different species or varieties the various streptococci found in human beings in health and in disease, have met with little success. There is a wide range of variation, of course, in all properties, but none seem sufficiently constant to serve as a basis of classification. We must, I think, recognize that a given streptococcus, at least for the time being, is endowed with certain biologic qualities which render it capable of producing effects which another streptococcus may not be able to produce, but such biologic differences are either too inconstant or beyond our control or methods of study to enable us to base species characters upon them."

Having determined the status of the infectious organism, let us inquire as to its normal habitat and the probable circumstances under which it invades and produces disease in the tissues of the body of man.

We know the normal habitat of the typhoid bacillus and the means by which it gains access to the body; we know the normal habitat of the bacillus of tetanus and how it gains entrance to its unwilling human host, and we are now in a position to declare that we know the normal habitat of the streptococcus and how, under certain circumstances, it can virulently attack and produce disease in man.

The nose, the antra of Highmore, the ethmoid cells, the sphenoid cell or cells, the frontal sinus or sinuses, the Eustachian tube, the middle ear and the mastoid antrum, present a continuous surface of mucous membrane of fairly identical

structure in all its parts, moistened physiologically by a more or less abundant mucous secretion and directly continuous by way of the nasopharynx with the pharynx, the tonsillar region and the mouth.

Lewis and Turner (50), of Edinburgh, published in 1905 a bacteriologic study of the nose and its accessory cavities and I have availed myself freely of their work for the reason that they have reviewed all of the previous literature and have, by their own labors, practically brought the subject down to date.

Thompson and Hewlett (36) in 1895 had examined ninety-one cover glass smears from nasal mucus and nasal mucous membrane and had found eighty per cent of those from the interior of the nose sterile. The vestibule was never sterile.

The work of subsequent observers, however, cast doubt upon these results. Klemperer, and Park and Wright (37) determined that the interior of the healthy nose is not free from germs and that the nasal secretion has no bactericidal action. They found only six cases sterile out of thirty-six specimens taken. Hasslauer (38) in an examination of 186 specimens from 111 nasal cavities found the *Staphylococcus pyogenes albus* in twenty-five per cent, the pneumococcus in 20 per cent, the streptococcus pyogenes in seventeen per cent, and the pseudo-diphtheria bacillus in thirteen per cent. Viollet (39) also found staphylococci, streptococci and pneumococci in normal nasal secretion. Finally Lewis and Turner endeavored to eliminate the sources of error encountered by their predecessors and undertook and published this most valuable and conclusive series of observations on the healthy and the inflamed nose, mouth and accessory nasal cavities.

They took twenty-six specimens from sixteen healthy noses, and of these only three were found sterile. Thirteen specimens from seven persons were mono-organismal. Nine from seven persons showed two varieties of bacteria. One specimen showed three varieties. The pneumococcus was found in four cases, staphylococci in thirteen, streptococci in six, Hoffman's bacillus in two, bacillus aureus in two, bacillus mesentericus in two, spirillum in two, bacillus of Friedlander, the proteus vulgaris and unknown bacillus in one each. Organisms from nine healthy noses were non-pathogenic on inoculation in animals. From two healthy noses pathogenic organisms were obtained.

From one of these the staphylococcus aureus and albus, produced local abscess in but were not fatal to guinea pigs. In the other case streptococcus pyogenes was present, the broth culture proving fatal to a rabbit in fourteen days after intraperitoneal injection of 2 c. c. Slow growth on culture media makes it appear "that the interior of the normal nose may appear sterile, owing to the fact that organisms, though present, occur in such few numbers as to escape recognition by rapid methods. Further it appears that the staphylococci found in the healthy nose are often of low vitality and do not grow so readily in ordinary media as the same varieties derived from pus. . . . It happened more than once that broth in which a swab had been immersed and incubated for forty-eight hours showed no cloudiness or other sign of growth in the first twenty-four hours; on the second day, however, the broth either became cloudy throughout or remained clear, but with distinct sedimentary growth. . . . The inference is that the nose contained numerically few organisms or that the organisms present in the nose were of diminished vigor and were revived after a period in a suitable medium, such as broth."

It appears that the organisms of the healthy nose belong to the same varieties as those found in abnormal conditions, but that they differ from the flora of pathologic nasal membrane in actual numbers, in purity of culture, in vigor of growth and in pathogenicity.

In inflammatory conditions of the nasal cavities, the organisms present belong to very much the same varieties as those which may be found in the healthy cavities. . . . All the varieties present may not be pathogenic on injection into animals, but usually one variety is virulent in the early stages of the disease. . . . The pathogenicity is high at first and diminishes rapidly so that an organism isolated in the first few days of a nasal catarrh and then very fatal to guinea pigs, becomes later incapable of producing any pathogenic effect. . . . To produce nasal inflammation not only is the presence of pathogenic varieties necessary, but these varieties must be virulent, or if avirulent, must recover their virulence by the influence of other factors.

Thirteen specimens were examined from eight acute cases and one chronic case of purulent nasal catarrh.

The streptococcus pyogenes was present in six of the acute

and in the chronic case—various staphylococci were present in six cases and the pneumococcus in one case. Of the eight acute cases, pure cultures of staphylococci were obtained in two and in the remaining six the streptococcus was the probable exciting cause.

In the chronic case, both were found, but the streptococcus was probably the etiologic factor. From three of the cases virulent pathogenic organisms were obtained—twice the streptococcus and once the staphylococcus pyogenes citreus. The streptococci in these cases were so virulent as to prove fatal to guinea pigs in twenty-four hours. Ten days later the streptococcus isolated afresh from the discharge in one of these cases proved nonpathogenic.

The pathogenic bacteria of the mouth include many varieties which are found in suppuration of the antrum and other sinuses. The streptococcus pyogenes, the staphylococci, the pneumococcus, the *B. diphtheriae* and the *B. pyocyaneus* are all found at times in the mouth. In addition to the organisms specially associated with carious teeth—streptococcus brevis, *B. necrodentalis* and staphylococcus albus—any of the denizens of the mouth may, of course, be found on the outer surfaces, if not in the deeper layers of the carious matter.

Törne (44) has published the only observations on the bacteria of the healthy accessory sinuses. He examined thirty-six cadavera in which the maxillary and frontal sinuses were healthy. Twenty-two were examined within two and one-half hours after death and in all these the sinuses were found sterile. Of the remaining fourteen examined, from three to twenty-five hours post mortem, seven were sterile and seven contained bacteria. This suggests that the entrance of organisms occurs some hours after death.

The maxillary and frontal sinuses were sterile in twenty-nine of the thirty-six cadavera examined within twenty-five hours post mortem. Törne also examined twenty-six pathologic cavities in sixteen cadavera. Eleven cavities examined three hours post mortem showed catarrhal changes, but nine of these were sterile. Twelve cavities showed chronic purulent inflammation. There were present streptococci, micrococcus pyogenes aureus, pseudo-catarrhalis, tardiliquans, etc. Three cavities in acute cases examined one and one-fourth hours after death, all showed bacillus pneumoniae.

Pearce (45) found inflammatory changes in the maxillary

antrum of many cases of diphtheria, with Klebs-Loeffler bacilli present in nearly all.

In four cases of diphtheria, complicated with scarlet fever, pus was found in the antra in three and the organisms present were streptococci and staphylococci. In 102 post mortem examinations in which the accessory sinuses were examined, Kirkland and Stacey (46) found thirty-four cases of infection by microorganisms in which streptococci, staphylococci and pneumococci were found.

Herzfeld and Herman (47) in ten cases of antral suppuration found the streptococcus in eight cases and staphylococcus in seven.

Howard and Ingersoll (48), in an investigation as to the causes of inflammations of the accessory sinuses, concluded that these inflammations are due to the bacteria which are commonly present in the buccal and nasal cavities—in the former in health and in the latter occasionally in health and usually in disease. These organisms are the diplococcus lanceolatus, streptococcus, staphylococcus pyogenes, *B. diphtheriae* and *B. influenzae*.

Stanculeanu and Baup (49) determined that, clinically and bacteriologically, there are two varieties of empyema of the facial sinuses, one with fetid pus following on dental affections (14) and the other of nasal origin with non-fetid pus—the latter being due to such organisms as the streptococcus and the pneumococcus. The greater frequency of anaerobic organisms in the mouth lends some support to these views. As to pathogenicity, they state that in cases of nasal origin the aerobes, and in cases of dental origin the anaerobes, are always found virulent on injection into animals.

Finally, Lewis and Turner themselves report on their extensive series of observations. They examined eighty specimens of pus from fifty-seven antral cavities. They found streptococci in 43 or 75.4 per cent, pneumococci in 42 or 74.1 per cent, and staphylococci in 40 or 70.1 per cent. Swabs were taken from the nasal chambers of forty-two of these cases. Pneumococci were found in twenty-nine, or 70 per cent, staphylococci in twenty-eight, or 66.6 per cent and streptococci in twenty-seven, or 64.3 per cent. Swabs were taken directly from the antral cavities in twenty-seven of the cases. Pneumococci were found in twenty-one, or 77 per cent, staphylococci in twenty-one, or 77 per cent, and streptococci in twenty-one, or 77 per cent. Of the forty-seven cavities, there were

only four in which the swab yielded an absolutely pure culture. In two, the streptococcus, in one the staphylococcus, and in one the pneumococcus.

Thirteen acute cases showed staphylococci in eleven, or 84.6 per cent; pneumococci in eleven or 84.6 per cent, and streptococci in eight, or 61.6 per cent. Forty-four chronic cases showed streptococci in thirty-five, or 80 per cent; pneumococci in thirty-one, or 70 per cent, and staphylococci in twenty-nine, or 66 per cent. The B. influenza, which was only obtained in one instance, occurred in a recent case of only three weeks' duration.

The authors state: "Though in the wealth of organisms associated in these cases, and possibly pathogenic, it could not be certainly stated which was the *fons et origo mali*, yet in some of the cases we were enabled to conjecture which organism was most probably responsible. This we did on consideration (1) of the pathogenicity of the organism (as ascertained by experiments on animals) and (2) of the organisms in direct swab as compared with nasal swab from the same case, and (3) of the persistence in chronic cases of particular varieties, and (4) of the occurrence in pure culture of one organism. In this way we are able, though with some diffidence, to assign the principal role to the pneumococcus in fourteen, to the streptococcus pyogenes in nineteen and to the staphylococcus in six of the fifty-seven cavities."

Among the recent cases, the pneumococcus was probably responsible for the inflammation in four, the staphylococcus in three, and the streptococcus in two—four cases being undeterminable. Among the long-standing cases, the pneumococcus was probably responsible in ten, the staphylococcus in three and the streptococcus in seventeen—fourteen being undeterminable.

In twelve cases, the antral disease was complicated by inflammation of the ethmoid in four cases, by disease of the frontal sinuses in six cases, and by disease of both ethmoid and frontal in two cases. Ten cavities showed staphylococci, seven showed streptococci and seven pneumococci. Pus from a chronic inflammation of the ethmoid sinus alone showed both streptococci and staphylococci. Pus from the frontal sinus alone showed in one case pneumococcus and staphylococcus, and in another case streptococcus and staphylococcus, and in a third case all three organisms.

In order to ascertain whether the combinations of organisms present might be pathogenic, even though the individual organisms in pure culture were not so, several injections of impure cultures were made. The results yielded no evidence that organisms, which in pure culture were non-pathogenic, would in combination give rise to disease. The reverse was, however, not the case, for in three instances a pneumococcus, which in pure culture was pathogenic, produced no illness when injected along with the other organisms present in the same case. Pneumococci, tested in ten acute cases, were pathogenic to rabbits in five, or 50 per cent. Staphylococci, tested in ten acute cases, were pathogenic to guinea pigs in five, or 50 per cent, and streptococci, tested in eight acute cases, were pathogenic in six, or 75 per cent.

Pneumococci, tested in seventeen chronic cases, were pathogenic to rabbits in five, or 29 per cent. Staphylococci, tested in twenty-eight chronic cases, were pathogenic in nine, or 32 per cent. In four cases in which the condition had lasted more than eight years, streptococci were found pathogenic to animals, but not fatal.

"In recent cases the organisms are pathogenic twice as often as in chronic cases." "In both recent and chronic cases, the streptococci are more pathogenic to animals than all other varieties." "The streptococci are almost always pathogenic when recovered from recent cases, but in chronic cases seem to have largely lost their virulent characters. There is no guarantee, however, that these organisms would remain so little virulent if by chance implanted on more suitable soil."

Iglauer (73) of Cincinnati, working in the Pathological Institute of Vienna, and taking nasal mucus directly from the posterior nares by means of a head section as soon post mortem as practicable, found, in twenty selected cases, the staphylococcus pyogenes aureus in eleven cases, the staphylococcus pyogenes albus in six cases, the diplococcus pneumoniae in eight cases and the streptococcus pyogenes in six cases. In fourteen additional cases in which there was a marked pulmonic lesion, he found the staphylococcus pyogenes aureus in seven cases, the staphylococcus pyogenes albus in eight cases, the diplococcus pneumoniae in eight cases and the streptococcus in six cases. Finally, as a negative contribution to the etiology of diseases of the maxillary antrum, the only one of the accessory cavities suspected of having any other than a nasal source for

the inflammations that attack it, I would quote Fletcher (70), who examined the 200 antra of 100 skulls for (1) abscessed teeth, (2) septa, (3) for conical protrusions of the roots of the teeth into the antrum, (4) for perforation by the roots of the teeth without protrusion and (5) for perforation of the antrum from ulcerated teeth. He says: "As to the molars, ulceration was found in more than 25 per cent of the skulls, there being in these 200 examinations fifty-seven ulcerated teeth, and out of these fifty-seven possible cases of perforation by inflammation and its results, we found such to be the case only four times, all other cases having perforated the alveolar border and discharged the pus into the mouth, two of them discharging both in the mouth and in the antrum." Lewis and Turner cite a number of observers to the same effect.

It is quite possible for bacteria to enter the middle ear and they probably do so, through the Eustachian tube, remaining dormant under normal conditions and eventually losing their vitality. In scarlet fever and other severe anginas, the micro-organisms effect an indirect invasion by way of the lymphatics—and in other diseases, such as endocarditis and diphtheria, by way of the blood vessels. Politzer (74) says that entrance may be effected from the external auditory canal through either the perforated or intact membrana tympani. Zaufal and Nadoleczny, quoted by Politzer, state that the streptococcus pyogenes and diplococcus pneumoniae are the exciting causes of acute otitis media. If the middle ear secretion is examined immediately after a paracentesis diplococci and streptococci occur just as often alone as in combination with other pathogenic micro-organisms. Except in the case of such specific diseases as diphtheria, typhoid, influenza and epidemic cerebro-spinal meningitis, where the specific micro-organisms of these diseases are found, the finding of micro-organisms in the discharge other than the pneumococcus or the streptococcus indicated a secondary infection.

Lermoyez and Helme (82) came to the conclusion from innumerable investigations that otitis media acuta is always of **mono-bacillic** origin and that the pneumococcus or streptococcus is seldom found in combination with other organisms. Secondary infection by the staphylococcus takes place only in the later course of the disease, per tubam or through the external auditory canal.

Before quitting the subject of the bacteriology of the

nose, the sinuses and the ear, I wish to call your attention to two significant observations. One was made by Dench and Cunningham (75) and reported to the American Otological Society in 1902 in a paper on "The Value of Bacteriological Examination of the Discharge in Acute Otitis Media as Determining the Necessity of Operative Interference." They say: "The presence of the pneumococcus as the sole etiologic factor signifies a rather mild form of inflammation in the mastoid cells. . . . On the other hand, it has been most interesting to note the rapidity with which the streptococcus infection develops. . . . The osseous structures have been found at the time of operation to be extensively involved, even in those cases which have been operated upon in the very earliest stages of the disease. In many cases in which the inflammatory process had existed but from forty-eight to seventy-two hours, extensive destruction of the bone had taken place." In four recent cases of streptococcus infection which had apparently cleared up, the patients returned complaining of a recurrence of the local pain with a slight discharge from the ear and an appearance of general sepsis and in these cases, upon operation, a most extensive destruction of the bony tissue was found. In three cases epidural abscess had been present and in a fourth case thrombosis of the lateral sinus existed at the time of operation.

The following tables, which require no explanation, are given:

Nature of Infection	No. Cases	Ice Coil	Operation	No Operation
Streptococcus (pure).	33	17	28	5
Staphylococcus.	3	3	2	1
Pneumococcus.	21	21	2	19
Mixed infection with streptococcus present.	25	19	23	2
Mixed infection with no streptococcus present.	9	9	3	6

Recovery.

	Ice Coil.	Operation.
Streptococcus.	14%	86%
Staphylococcus.	33 1/3%	66 2/3%
Pneumococcus.	90%	10%
Mixed with streptococcus.	8%	92%
Mixed no streptococcus.	66 2/3%	33 1/3%

The other significant observation is, from the pathologic laboratory of the Ancon Hospital, Isthmus of Panama. Darling (56) writes: "This communication contains some of the results of an investigation which is being conducted to determine the relation of inflammation of the accessory nasal sinuses to pneumococcus infections. . . . The accessory sinuses have been examined with regard to this point in fifty-two autopsies, twenty-seven of which were pneumococcus infections, as follows: Lobar pneumonia, 22; acute pericarditis, 1; acute meningitis, 9; pneumococcus septicemia, 5. The remaining cases were controls.

It has been found that 92 per cent of all pneumococcus infections coming to autopsy show in a very marked degree more or less typical pneumococcus inflammation of one or more of the accessory nasal sinuses. The inflammation is generally intense. It is fibrinopurulent in character—fibrin and mononuclear cells being abundant. Pneumococci are always present and in numbers depending on the duration of the process. A point of great importance is the age of the sinus affection, which has been appreciably greater than that of the lung or meningeal lesion. Ninety-one per cent of the lobar pneumonia cases showed a sinusitis. All cases of acute pneumococcus meningitis presented an inflammation of one or more of the sinuses and in every one the middle ears and mastoid cells were normal. In the pneumococcus septicemia group, 80 per cent were found to be associated with a sinusitis."

Is it not possible for us now to assign their proper pathogenic role to the two principal pathogenic bacteria which have their normal habitat in the nose and its accessory sinuses—the pneumococcus producing such a disease as lobar pneumonia; acute purulent cerebro-spinal meningitis (pneumococcus), endocarditis, pericarditis and mild infections of the middle ear—while the streptococcus produces—starting, as it does, from the same base—violent inflammations of the ear—purulent meningitis, cerebral abscess, metastatic abscesses of various kinds, and, as I shall now proceed to show, erysipelas.

As is almost invariably the case with any material advance in our knowledge of the physical and biologic sciences, it happens that a number of pathologists in different countries have made approximately the same suggestion, at about the same time, but either because their theories were advanced through some medium that had but a limited circulation in a language not generally read, or because their papers did not fall

under the notice of systematic students of and writers upon pathology, or because the amount of evidence they could produce at the time was not sufficiently convincing—it is that up to the present their work has attracted but little if any attention.

H. M. Fish quotes Riberi as having in 1845, traced two cases of orbital abscess to a sinusitis, and as having said: "Intraorbital abscesses, observed at times after facial erysipelas, are not the result of the erysipelas, but, on the contrary, they are the cause or place of departure"—and quotes Zucarini as saying in 1853—"The increased secretion of mucus within the sinuses, when drainage is insufficient, soon changes to a mucopurulent form; its resorption induces erysipelas, and the appearance, increase and subsidence of the erysipelas depends entirely upon a successful drainage of the cavities." In 1891 Luc (14) reported the following significant case—"Following upon an erysipelas of the face which had already manifested its suppurative tendency by occasioning, in the course of its evolution, an abscess of the lid, the symptoms of an empyema of the left antrum of Highmore appeared. Only after 9 months was this empyema recognized and operated upon and an examination of the pus revealed the exclusive presence of the chains of streptococci characteristic of erysipelas

Some days after the double operation (removal of polypous masses from the middle meatus and opening the antrum from the mouth) and without having been, at least apparently, submitted to any contagious influence, but after several excursions through intense cold, the patient was attacked by a facial erysipelas which began at the left nostril." Previous to seeing this case Luc believed that all empyemata of the antrum of Highmore were of dental origin. His earlier cases he believed could all be traced to dental caries; the pus from the cavities contained many varieties of organisms and it was invariably fetid. In this erysipelatous case, however, Dr. Ledoux Lebard found streptococci in pure culture in the antrum (the teeth of the patient were sound) while in another antral case operated upon at the same time by Luc, the origin of which was undoubtedly dental and in which the pus was malodorous, Lebard found staphylococci, diplococci, long filaments of short, round, oval or rod-like segments and isolated bacilli and micrococci. In 1896 a Swedish author, C. Janson (51), in a remarkable article on "Causes of Infection in Facial Erysipelas" (*Förhandlingar vid Första Nordiska Kongressen*,

August, 1896), first formulated the correct theory of the etiology of the disease without, however, adducing any cases in proof of his contention, which may be the reason why the paper has attracted so little attention. I translate a few paragraphs as follows: "It must strike one as remarkable that facial erysipelas is so much more frequent than all other forms of erysipelas. The constant exposure of the face cannot be the only reason, because the hands are equally exposed and much more frequently come in direct contact with substances that might cause infection—yet erysipelas of the hands is relatively a rare occurrence. Facial erysipelas generally begins at the nose, and fissures at the entrance of the nares have long been regarded as the points of entrance of the infection. Two symptoms are found in this disease that are frequently overlooked although they very often usher in the erysipelas—viz., nasal catarrh and inflammations of the pharynx. When we consider this it is rational to assume that the cause of the infection in erysipelas has its origin in the nose and pharynx.

It has been demonstrated that streptococci can always be found in the pharynx of a healthy person, and they could—even if under ordinary conditions they are non-virulent—assume an activity that would develop erysipelas or a fatal septicemia. . . . The author believes that in general the streptococci, which are harmless saprophytes in the pharynx under certain as yet not well understood conditions, can cause facial erysipelas with or without angina or coryza as a primary cause and that the infection usually develops in this manner. Streptococci then come to belong to the same group as the pneumococci and colon bacilli—viz., saprophytes with facultative virulence."

Six months later Mermet (11) in discussing palpebral erysipelas brought forward considerations of almost equal theoretical significance. He pointed out "that the streptococcus is not an habitual inhabitant of the skin, that we have not been able to find it on the normal lids and that Achalme has not been able to obtain cultures exposed freely to the air even in wards affected with erysipelas—note finally that the absence of predisposition of this affection for the lids of the right side seems to preclude the idea of a contamination by the hands of the patient. . . . Very frequently the streptococcus infection of the lids is secondary either to an external erysipelas or to an affection of the lachrymal sac and canal,

of the conjunctiva or of the cavities of the face. . . . We should point out here a fact of the greatest importance: it is the predilection that the streptococcus has to travel by way of the lymphatics and the subcutaneous tissue, evincing a preference for the ascending channels of the mucous membranes. This observation accounts to us for the predominance of streptococcic lid lesions considering the conjunctival determinations in the cases of palpebral erysipelas consecutive to infections of the sac or the upper lachrymal canal." In discussing recurrent erysipelas Mermet observes "one can very easily conceive that the streptococci which normally inhabit the mouth, the nasal fossae and the lachrymal ducts in the quality of inoffensive guests recover their virulence under some influences analogous to those which experimentation has realized and invade the lids."

H. Roger (69) also, after a personal study of 957 cases says:—"Classic authors consider an erysipelatous angina as very frequent; our observations on this point do not accord with this opinion. Very often, it is true, the patients complain of having suffered with sore throat, but the objective examination was entirely negative and a close inquiry indicated to us that it was a matter in reality of painful swelling of the cervical glands. Adenitis frequently accompanies erysipelas. In 21 cases it has preceded by at least one day the cutaneous eruption. The nasal fossae, we believe, ought to be suspected more often than the pharynx; in many cases the patients were suffering with coryza for a greater or less time and the infection seems to have invaded the skin by way of an ulceration of the mucous membrane at the nasal vestibule." He refers also to the fact that streptococci spread anteriorly upon the skin may penetrate the cutaneous glands and there develop into inflammatory activity upon the occasion of an intercurrent cause such as a chill. A. Logan Turner also adds a definite expression of opinion in his recent work on *The Accessory Sinuses of the Nose*. He says: "Suppuration has been ascribed by Weichselbaum to an attack of facial erysipelas; it is more reasonable when these conditions are associated to regard the erysipelas as secondary to the nasal discharge."

The French authors and teachers seem to have appreciated the causal conditions of facial erysipelas for a number of years past. Thus we find in a thesis for the doctorate at

Bordeaux by Fauveau the following most excellent description: "In medical erysipelas" (spontaneous, idiopathic) "the port of entry of the contagion frequently passes unperceived, when the site of the disease is the face, because it is hidden in the natural cavities such as the mouth, the pharynx, the external auditory canal or the nasal fossae. . . . It is frequently by way of the nasal mucous membrane that the facial erysipelas that is called spontaneous or recurrent erysipelas arises. The pharynx is also one of the seats of predilection of erysipelas of the mucous membranes. From there it extends itself easily, thanks to the laxity of the tissues of this region and their abundant blood supply to the whole vault of the pharynx with all its anfractuosités, to the veil of the palate, to the buccal mucosa and to the nasal fossae. This spread of the streptococcic infection is important from the view point of the explanation of the ocular complications which it is able to provoke. Almost always, indeed, it is observed that an erysipelas occurring or beginning in the nasal fossa shows itself without by emerging either through the anterior orifice of the nose, or, and this is the condition which interests us particularly, by the orifice of the lachrymal canal at the internal angle of the eye. In the article on Erysipelas in the Dictionary of Jaccoud, Maurice Reynaud expresses himself thus—'I am brought to believe that the greatest number of cases of erysipelas of which the first manifestation appears as a red patch at the root of the nose have in reality emerged from one of the lachrymal points and have taken their origin in the corresponding nasal fossa.' It is indeed this manifestation on the part of the lachrymal channels that indicates the nature of the rhinitis of which one has only observed the external manifestation. It is in fact often difficult to establish the diagnosis between erysipelas limited to the nasal mucosa and certain intense coryzas—especially those whose general symptoms present in a majority of cases an unwonted severity and in which the temperature is quite elevated."

Following upon this theoretical discussion and the quotation of the views of men of wide experience and keen observation allow me to cite concrete instances where facial erysipelas took its origin in or from the nose, the accessory nasal cavities or the ear.

Mercier—Bellevue (81) in commenting on a case of facial Erysipelas occurring in the course of and due to a sinusitis of

the maxillary antrum and frontal sinus says: "The interesting point in this observation appears to me to reside in the etiology, or better, the pathogeny of this case of facial erysipelas occurring abruptly in a man appearing to enjoy excellent health. As I said in my opening remarks, the complications of sinusitis are as numerous as they are frequent; so, on the one hand, one finds on the part of the sinus the explanation of those gastro-intestinal or pulmonary affections which are so rebellious to all our remedial measures, and on the other hand, in a chronic or acute suppuration of a cavity of the face one can find the explanation of those cases of recurrent erysipelas which one combats so vigorously but which one cures so rarely because one does not know the real cause of them." In the course of the discussion M. Bessonnet said that he had seen erysipelas follow simple acute coryzas.

H. Roger (69) made personal observation of 957 cases of erysipelas. He divides them, after the classic authors, into traumatic and nontraumatic—i. e., into those in which an antecedent wound was visible and those in which no wound or abrasion was visible. Their distribution was as follows:

	No. of Cases	Nontraumatic		Traumatic		Total	
		M	F	M	F	M	F
Face.	469	183	219	35	32	218	251
Face and Neck.	96	24	53	15	4	39	57
Lower Limbs.	19	3	4	6	6	9	10
Upper Limbs.	9	2	1	4	2	6	3
Trunk.	4	2	1	2	2	2	2
		<hr/>		<hr/>		<hr/>	
	597	214	278	62	46	274	322

Nontraumatic—492.

Traumatic—108.

In 488 cases of facial erysipelas the distribution was as follows:

Cheek.	112	Scalp.	24
Internal angle of eye.	95	Forehead.	17
Base of the nose.	83	Upper lid.	12
Lids.	50	Temple.	9
Wings of nose.	41	Top of nose.	4
Ears.	36	Neck.	2
Chin.	3		

Spohn (77) collected by circular letter the details of 1,000 cases of erysipelas. Nine hundred were facial—of the facial the beginning point of the disease was—Scalp 3, Cheek 3, Lids

7, Ears 60, Lips 90, Nose 737. Eighty-two per cent began at the nose.

Spohn concludes "a careful examination will reveal that all or nearly all cases of facial erysipelas unless traumatic, had a previous chronic catarrh and a partial or total stenosis of one of the nostrils."

Welty (78) of San Francisco made a personal examination of some 60 cases of facial erysipelas which he reported to the Americal Medical Association. Unfortunately his records were destroyed by the earthquake and fire of 1906. He reports from memory. Eight patients had more than one attack and pus (in the nose) was always demonstrated in their cases. The point of inoculation in a large majority of cases was about the nose. More than 90 per cent complained of nasal affections accompanied with a discharge. In 60 per cent of the whole number of cases he demonstrated pus in the ear or nose. The bacteriologic examination of 30 cases of erysipelas demonstrated streptococci alone.

Examination of secretions from ear and nose showed mixed infections—streptococci always present. In the discussion that followed Farlow of Boston reported the following cases: Man of 40. Recurrent erysipelas. After treatment of an erosion of the septum no further attacks of erysipelas.

Patient aged 50—recurrent erysipelas. Treatment of an erosion of the septum prevented further attacks. Woman aged 40—recurrent erysipelas. Treatment of septal erosion prevented further attacks. Woman aged 84—Facial erysipelas. T. 103 and a tendency to coma. Farlow washed out the nose, treated a septal erosion and the next day the temperature was nearly normal. Dr. Mosher of Boston said that a routine examination of the nose in cases of erysipelas had been the custom at the Massachusetts General Hospital for years. The dermatologists always send their erysipelas patients to the Eye and Ear Infirmary for examination of the nose.

Stein (79) reports a case of chronic nasal catarrh; acute exacerbation. Neuralgic pain right side of head—Occlusion right nostril. T. 105 F. Rhinitis—Sinusitis—"Streptococci present in profusion." On the third day "a small area of redness made its appearance over the bridge of the nose, etc." Erysipelas. Examination of vesicles and pustules showed streptococci.

In cases of erysipelas with prodromal fever, as occurred 28

times in 69 cases, there is frequently an antecedent affection of the throat. The erysipelas spreads to the skin of the face through the nasal passages, the lachrymal canal or through the Eustachian tube and the external auditory canal. "Physiologic wounds"—clefts—are present in the mucous membrane covering the lymphoid tissue. Gerhardt, Berlin. *Klinische Wochenschrift*—No. 3. s. 45-1887.

Clinical observations on a mild case of erysipelas which developed from a chronic scrofulous rhinitis. Arnaldo Cantini, *Bollet delle Cliniche* No. 2-188.

Three cases of chronic antral disease which had annually passed through one or two attacks of facial erysipelas for the preceding five years. After operative interference upon the antral contents, erysipelas did not recur.—Hajek *Pathol. u. Therap. der Entzünd Erkrank der Nebenhöhlen der Nase*, 1899, p. 77.

Cases of erysipelas of the pharyngeal mucosa are rare, but they are of great moment, as a secondary facial erysipelas may follow on a primary erysipelas of mucosa of the nose, throat and mouth. A case of this kind occurred in Schwartze's ear clinic. A patient who had had a tonsil removed visited another patient with erysipelas and thus acquired an erysipelas of the nasopharynx which spread through the Eustachian tube into the middle ear, the external canal, the auricle and the face.

Rendu saw a man with specific glossitis in whom he identified erysipelas by bacteriological examination. The erysipelas spread to the face. *France medicale*, 1892.

Erysipelas of the mucous membrane of the nose either begins in the pharynx, extends through the nose and then spreads over the face or it progresses in the opposite direction.—*Die Krankheiten der Nase, Ihre Nebenhöhlen und des Nasenrachenraumes*—Zarniko—Chap. 8 Rhinitis purulenta acuta—p. 166, P. 472.

Clergyman aged 48. Boil in the nose. Opened after 7 days. T. 103 F., P. 110. "Swelling and redness of the nose was marked and decidedly erysipelatous in character." Disease pursued a typical course except that there was some involvement of the posterior nares and the pharynx, and later more or less hemorrhage from the bowels for a week.—J. M. Harwood, Shelbyville, Ky. *American Pract. and News*, April 30th, 1887.

Case I.—Child aged 4. Acute nasal catarrh and facial ery-

sipelas commencing on the bridge of the nose. Warm alkaline nasal injections without any other treatment markedly improved the nasal condition and the erysipelas.

Case II.—Boy aged 12. Hypertrophic nasal catarrh. Recurrent attacks of erysipelas of nose and cheeks. Treatment of the nose caused the permanent disappearance of the erysipelas.

The reporter also says he has notes of two similar cases of his own and four of his colleagues. "In the cases referred to above the erysipelas always commenced on the bridge of the nose and was greatest on the side of the greatest pressure. There was no condition present in the nasal chambers that I could recognize as of an erysipelatos nature in any of them."—Geo. W. Major, Montreal, Can. *N. Y. Med. Jour.*, Aug. 10th, 1889.

A mechanic, 25 years of age, developed erysipelas on the left side of his face after a cold. (See also list of ocular complications after erysipelas.)—Leber, *Archiv. f. Ophth.*, Vol. xxvi, Part 3, p. 224.

With symptoms of a pharyngitis and inflammation of the upper passages, pains in the chest and difficulty in swallowing, a woman of 30 entered the hospital; here fever and delirium were added. In 9 days a facial erysipelas began at the nose. In a few days it disappeared without recurrence. (See also list ocular complications after erysipelas.)—Duroziez, *Archiv. de Med.*, 5 sec. Txxv, s. 698.

Case I.—Man aged 29. Pharyngitis and slight earache. Post-pharyngeal abscess. Incised liberally; three or four grams pus. Pharyngeal tonsil removed. Two weeks later, acute otitis media. Paracentesis M. T. releasing bloody pus. Walls of pharynx greatly tumified and of a dusky red. The left nasal cavity swelled shut, T. 103 F., and erysipelas now spread from nostril over entire face. Severe case. One relapse. Recovery.

Case II.—Woman aged 25. Facial erysipelas which had arisen at the right nostril spread over the face and disappeared. The nasal passages were swollen and the pharynx reddened. There had been sore throat for some months; ear trouble had appeared one week previously, the M. T. bursting spontaneously. Mastoid tender. T. 103, P. rapid and feeble. A few days later erysipelas appeared again at the tip of the nose and spread over the face.—H. V. Wurdemann, *Medical News*, Nov. 21st, 1891.

Gasser reports: Erysipelas about the left orbit. On fourth day a flow of mucus from nostril, pain in temporal region, death on sixth day. Ethmoiditis found at autopsy. Quoted by Fish, *Am. Journ. Surgery*, Sept., 1906.

Vacher (83) of Orleans reported to the Société belge d'otologie a case of facial erysipelas in a woman which followed a paracentesis M. T. evacuating blood and pus in the course of a violent otitis and mastoiditis. She had suffered for a number of years from a chronic dacryocystitis in which the sac was daily emptied by pressure, the mucopurulent contents being expressed into the nose.

A woman of 38 developed facial erysipelas which, possibly originating in an excoriation at the right ala of the nose, followed a rapid cooling of the body. The lids swelled and both eyes protruded. (See also list of ocular complications after erysipelas.)—Jager, *Ophthalmoskop. Handatlas*, 1869.

Fig. 75—Plate xvl:

Man aged 35. Complained of exophthalmos and a discharge from the nose of one year's duration. Eye displaced down and out. Upper lid thickened and drooped, covering a soft swelling in upper part of orbit. Pressure on swelling caused thick pus to appear in left nasal passage. Ocular mobility restricted. Venous congestion of retina. Left middle turbinate hypertrophied. Middle meatus contained polypi and offensive pus. Probe detected extensive necrosis ethmoid cells. Patient excellent health. Futile attempts made to treat the case by intranasal operation, but disease was too extensive. Operation under ether. In completing external incision at inner orbital margin an abscess cavity was opened. Floor and inner wall of frontal sinus extensively diseased as also the ethmoid labyrinth. The sphenoidal sinus was healthy. Seventeen days after operation erysipelas appeared, lasting nine days. Recovery.—Arnold H. Knapp. *Archives of Ophthalmology*, Vol. XXVIII, p. 50.

Case I.—Contagion arising from abrasion in the anterior nares in a patient who was in the habit of picking the nose and who had visited and nursed an erysipelas patient in the neighborhood. Acute suppuration in the left middle ear occurring after extension of the erysipelas to the nose and throat. Recovery after one relapse. Microscopic examination of ear discharge revealed several forms of pus cocci including streptococci.

Case II.—Beginning in an abrasion of the m. m. of the lower lip in a pipe smoker, extending through the buccal cavity to the nasopharynx, through the Eustachian tubes to the middle ears, causing suppuration. Extension to face and scalp. No history of contagion. Recovery.

Case III.—A scrofulous child with erosion of anterior nares and upper lip from purulent rhinitis. Facial erysipelas. Recovery.

Case IV.—An old man, whose nasal passages had been occluded for years by an enormous number of polypi the operations for which were made daily for about a week. Considerable malodorous purulent discharge followed. After attempted disinfection, the galvano cautery was used and two days later erysipelas appeared in the nares extending over the face. Recovery.—H. V. Wurdemann, *Med. News*, Nov. 10th, 1894.

A working woman, 56 years of age, poorly nourished, who suffered with chronic rhinitis, developed facial erysipelas with involvement of the lids. (See also list of ocular complications after erysipelas.)—Mitvalsky, *Klin. Monatsbl. f. Augenheilk*, 1893—s. 18—Aschenborn, *Archiv. f. klin. Chirurg.*, XXV—s. 154.

A primipara, aged 33, complained of pain and sensation of tension in the nose on the day of delivery. She had suffered from nasopharyngeal catarrh in the last days of her pregnancy. Two days after delivery the nose and the lids of both eyes were so swollen that the eyes could not be opened. Violent erysipelas developed. (See also list of ocular complications of erysipelas.)—Joss. *Correspondenzbl. f. Schweizer Aerzte*. Bd. XXXI—1901—s. 617.

Laborer, 37 years old. Considerable swelling of the tongue, which began at the anterior half at a point of ulceration, the result of a carious tooth. The swelling was so great that the patient could not close the mouth. There was debility, headache and fever. Violent erysipelas. In the course of a few days the pharynx and, in succession, the cheeks, the nares, the eyelids, the ears and the scalp became involved.—Garel, *Annales des. mal. de l'oreille*, May, 1891.

"Cauterization of the nasal mucous membrane is not entirely free from risk. Cases have been met with in which erysipelas of the nose and face, otitis media, ocular troubles, such as amblyopia and venous engorgement of the eye with

papillary hyperemia have occurred." . . . "In cases of recurrent erysipelas of the face the pharyngeal tonsil has apparently been the starting point of the erysipelas and it is well known that the nose, especially when affected with chronic rhinitis, frequently gives rise to facial erysipelas. These facts should emphasize the importance of the careful examination of the nose and nasopharynx in cases of recurrent erysipelas of the face and they would also suggest a possible mode of origin of pharyngeal and laryngeal erysipelas, because if the disease can spread externally there is no reason why it should not spread internally."—*Diseases of the Nose and Throat*, Hall and Tilly. Second Edition, 1901.

Facial erysipelas occurring in a case of melancholia. "The patient had a well defined facial erysipelas, beginning on the right side of the face just in front of the ear and in the external canal of the left ear, from which came a seropurulent discharge."—*Jour. Am. Medical Ass'n*, 1900, XLII, p. 647.

Woman, aged 70. Erysipelas of the face having begun at the nasal orifice on the right side, involving the right half of the nose and cheek. Throat red, tongue dry. (See also list of ocular complications after erysipelas.)—F. Terrien, *Neurite et atrophie optique au cours de l'erysipele*. *Progress Med.*, Paris, 1904, XX, p. 165.

In addition to the case mentioned in the discussion of Dr. Welty's paper at the meeting of the American Medical Association, Dr. John Farlow of Boston reports the following cases:

Case I.—Woman, aged 40, had had a number of severe attacks of facial erysipelas at frequent intervals. Marked erosion of the septum. Another attack of erysipelas threatened. Thorough cleansing of the nose caused the symptoms to disappear and she went nine years without another attack.

Man, 52 years, had a very severe attack of facial erysipelas. Nose examined later and marked septal erosion with bloody crusts found. On one occasion the nose became reddened, but treatment of the septum stopped what the patient feared would be another attack of facial erysipelas. In the discussion Dr. S. Johnston said he had seen one case of facial erysipelas having its origin apparently in a perforation of the nasal septum.—*Trans. 25th Ann. Meeting American Laryngological Assn.*, 1903.

In Welty's valuable article, besides recording his own experiences and referring to nine similar reports in the litera-

ture, he refers to the following presumably unpublished cases: "Dr. Able Johnson, San Francisco, has seen four cases of erysipelas in European clinics. In 2 he was able to demonstrate pus in the nose; 2 followed surgical interference, 1 for extensive removal of polypi accompanied by pus, 1 following the removal of the inferior turbinated in which pus was not demonstrated. Dr. Albert Houston, San Francisco, has seen 2 cases follow surgical operations on the nose for the removal of polypi. In the Vienna Nose and Throat Clinic I have seen 3 cases of erysipelas develop while the patients were under treatment. . . . I also observed 3 cases of erysipelas following mastoid operations, 1 in Halle and 2 in Vienna."—C. F. Welty, *Jour. American Med. Assn.*, Dec. 22nd, 1906.

Facial erysipelas being such an extremely common disease and the microbic cause of it having been so firmly established, individual cases of it are no longer reported in the literature unless for the purpose of noting some complications, such as meningitis, intestinal hemorrhage, orbital abscess or severe ocular complications.

So few have as yet recognized the local origin of the infection that it is only in the literature of rhinology that a distinct exposition of the predisposing and exciting causes may be found. Knowing, however, that a large amount of valuable data could be secured upon application to the proper sources of knowledge, I addressed a circular letter to the members of the American Laryngological Society, the American Otological Society, the American Academy of Ophthalmology and Otolaryngology and the American Ophthalmological Society.

This letter solicited replies to the following questions:

- A.—Have you had any cases of facial erysipelas (or erysipelas of other parts of the body) which you could consider as due to disease of the nose or its accessory sinuses?
- B.—Have you had any cases of erysipelas following upon operations performed upon the mastoid for either acute or chronic disease?
- C.—Following upon operations performed upon the nose for acute or chronic disease?
- D.—Following upon operations performed upon the antrum of Highmore for acute or chronic disease?
- E.—Following upon operations performed upon the ethmoid cells for acute or chronic disease?

F.—Following upon operations performed upon the sphenoid body for acute or chronic disease?

G.—Following upon operations performed upon the frontal sinus for acute or chronic disease?

H.—Have you had any cases in which more or less extensive damage was done to the eye as the result of an attack of facial erysipelas, and if so, could you trace the cause of the erysipelas in these cases? Did any of these cases have diseased nasal chambers or disease of the accessory cavities?

I have to extend my sincere thanks to the gentlemen of these societies for the very large number of synopses of extremely interesting cases which they have sent me. I appreciate the trouble they have taken and hope they will derive some satisfaction out of having helped to clear up a subject which does not appear to be entirely clear to some of our co-ordinate branches of medicine and surgery.

The answers, as I append them below, are lettered to correspond with the letters of the questions as given above for ease of reference.

Cases of erysipelas occurring in course of and due to disease of the nose or accessory sinuses, or following upon operations upon the ear, the nose or the accessory sinuses:—

J. F. Crouch, Baltimore. *A.*—One case due to infection of ethmoidal or frontal sinus. *B.*—One case. Acute mastoiditis. Operation. Erysipelas on third day. Recovery. *C.*—Two cases of excision of cartilage of septum. Erysipelas on second day. Recovery without effect on field of operation. *A.*—Man aged 53. Disease of ethmoidal sinus of right side; developed erysipelas of lids and orbit which on fifth day caused death, with symptoms of septic meningitis.

C. M. Reyher, Garrett, Ind. *B.*—Had the following personal experience: Tonsillitis, acute nasopharyngitis. Infection of the middle ears through Eustachian tubes by douching out of pharynx and nose. Acute otitis and mastoiditis right and left. Operation on both mastoids. Five days later erysipelas spreading over face, neck, chest, abdomen and back. Duration of erysipelas attack, 3 months. Operation wounds discharged for 5 months.

A. E. Prince, Springfield, Ill. *A.*—Four or five cases in conjunction with acute mastoid disease. *B.*—One case following operation for acute mastoid disease.

W. H. Haskins, New York. *B.*—Two cases following operation for acute mastoiditis. Recovery without sequelae. One doubtful case diagnosed erysipelas, but may have been a dermatitis following use of iodoform.

Herbert Harlan, Baltimore. *B.*—Woman aged 71 years, Erysipelas appeared fifth day after operation for acute mastoid disease. Desperately severe case for four or five weeks. Recovery.

Geo. F. Hawley, Chicago. *B.*—Operation for acute mastoiditis. Fistulous opening remained. Secondary operation performed. Notwithstanding all precautions in operation and after-treatment, erysipelas on third day. Had not been a case of erysipelas in hospital for six months and was first time patient suffered from disease. *C.*—Erysipelas following operation for fractured nose. Antiseptic precautions taken, but in vain. Infection may have taken place at time of fracture and laceration.

R. S. Lamb, Washington. *B.*—Woman aged 33. Operation for acute mastoid disease. Erysipelas developed on fourth day. Twelve days later wound reopened and necrotic tissue removed.

Randolph Brunson, Hot Springs, Ark. *A.*—Three cases of erysipelas having origin in suppuration of middle ear. One in acute suppuration, two in chronic suppuration. *A.*—In the course of a chronic suppuration from the nose, erysipelas developed and extended over one side of face, having its origin in nasal cavity. Duration a few days. *D.*—Same cases as above. Operation for draining suppurating antrum of Highmore through the canine fossa. Two weeks later erysipelas developed and traveled over same side of face. Duration a few days. *C.*—After operation on frontal sinus erysipelas developed, apparently from external wound, and patient subsequently died from meningitis during time erysipelas was at its height. Operation under bad surgical environment.

J. C. Easton, Springfield, O. *A.*—Facial erysipelas as the result of an abrasion near the inner canthus of right eye. Spread over lids, brow and right side of face. Acute rhinitis part of the time, but this was late in the disease. In a few days there was sloughing of tissue at initial point. Incision made, pus evacuated. On probing in region of ethmoid cells more seropurulent matter evacuated. (See also list of ocular complications after facial erysipelas.)

W. Sohler Bryant, New York. *A—Case I.*—A case of

purulent pansinusitis with facial erysipelas every year or two. It commenced on the alae nasi or on upper lip close to nasal orifices and spreads over the whole head. *Case II.*—Case of acute purulent rhinitis. The erysipelas commenced at the orifices of the nose and spread over cheeks and the whole head. *B.*—Has recently seen in consultation a severe case of erysipelas with temperature range 105 F.-106 F., and profound sepsis in a man, following a mastoid operation consequent to grip infection. Erysipelas commenced in pinna and spread to whole head, neck and back down to buttocks.

M. A. Hughes, Salt Lake City. *A.*—Man aged 45 years. Small ulcer in left nostril which he irritated with finger nail. Erysipelas of all accessory sinuses of left side of nose, ultimately involving eye and meninges of brain. Death from cerebral involvement on sixth day. Patient treated conjointly with the late Dr. J. McKenna.

H. S. Birkett, Montreal, Can. *A.*—*Case I.*—A girl, 10 years of age, suffering from atrophic rhinitis, developed a double acute suppurative frontal sinusitis, followed during the course of the inflammatory condition by an attack of acute erysipelas. It showed itself over the region of both frontal sinuses and extended upward to the middle of the scalp. Recovered under the use of antistreptococcus serum. *Case II.*—A man, aged 60 years. Erysipelas showed itself over the nasal bones and extended slightly on to both cheeks, due (in Birkett's opinion) to the abusive use of snuff. No recurrence of erysipelas since the discontinuance of the use of snuff.

N. McKittrich, Burlington, Ia. *C.*—Was called to see a supposed case of la grippe. Slight redness and swelling of lower portion of nose was present. Learned on inquiry of a cauterization of enlarged turbinal shortly before onset of illness. Diagnosis of erysipelas was confirmed by rapid spreading of disease and death on fifth day.

Kaspar Pischel, San Francisco. *A.*—One case facial erysipelas due to polypi of the nose. Cannot give synopsis of history, as records were burned.

John-E. Weeks, New York. *A.*—Physician, aged 51, had a small ulcer on the septum nasi, right side, which was present more or less constantly for a number of years. Character unknown. Ulcer about two-thirds of the distance back from the anterior nares. Had three attacks of facial erysipelas, originating, according to the testimony of the patient, who was

a close observer, in this small superficial ulcer. Ulcer observed by Dr. Weeks from time to time.

H. H. Briggs, Asheville. *A.*—Male, aged 47. Otherwise healthy. Seen in consultation. Inflammation beginning in nostrils as if from an acute rhinitis. Spread all over face and ears and on to the scalp; also into the pharynx and Eustachian tubes and to the middle ear, the M. T. perforating. The head of patient was much swollen. The eyes escaped, although there was stenosis (temporarily) of the lachrymal duct. Not having seen patient before onset of disease, do not know if he had any previous accessory sinus involvement. *D.*—*E.*—*F.*—*G.*—Female, aged 44. Chronic empyema antrum of Highmore, sphenoidal sinus, anterior and posterior ethmoid cells and frontal sinus on left side. Ethmoid, sphenoid and antrum operated upon. Nasal duct enlarged into frontal sinus. Finally opening through frontal bone was made and sinus curetted. Patient went home and some weeks later had an erysipelas about the fistulous opening. Process was arrested by treatment.

L. C. Cline, Indianapolis. *B.*—Male, aged 26. Operation for chronic mastoid disease. Five days later erysipelas extending above and to the front, involving the eyelids and causing a superficial abscess above and in front of the ear. *D.*—Two cases after operation upon the antrum of Highmore. Recovery without complications.

W. H. Peters, Lafayette. *A.*—Fissures of the vestibule were present in two cases preceding the disease. *A.*—"J. T. S., embalmer, aged 31, came for an operation for deviation of septum. It was on Saturday. I postponed the operation until Tuesday. On Tuesday morning he came with a T. 103.6 F., and I referred him to his family physician. Erysipelas appeared within twenty-four hours, beginning on the side of the nose in which I was to have operated, covering the whole head, neck and front of the chest below the nipple line. There were abscesses of both tear sacs, of the antrum of Highmore on the occluded side, and extensive abscesses of the scalp. The patient recovered; but if I had operated at the appointed time, namely, on the day he consulted me (Saturday), no man living could have convinced me that the operation had not caused the erysipelas, though not necessarily through any fault of mine."

W. H. Dudley, Los Angeles. *A.*—Has seen erysipelas occur

following throat inflammations and acute ear conditions. His records are not at present accessible to him.

H. O. Reik, Baltimore. *B.*—One case following acute otitis media suppurativa, beginning December 25th. Mastoiditis, with extensive subperiosteal abscess extending in front of auricle. Long neglect. Operation early in February. Three weeks later, returning for dressing, was found to have facial erysipelas. Serious illness followed. Cured by anti-streptococcus serum. Pneumococcus from ear and mastoid, *B.*—One case after tympano-mastoid exenteration. Like the first case it occurred weeks after the operation, but while dressings were still being made. Mild case.

Ford, ————. *A.*—One case of chronic suppurative otitis media gives a history of two attacks of erysipelas.

G. P. Head, Chicago. *A.*—Boy of 15. Very marked deviation of septum. Almost complete occlusion of one side. Had had a vestibulitis for some weeks. Erysipelas began at edge of right ala nasi and spread over right cheek and nose.

S. D. Risley, Philadelphia. *A.*—"One case following or possibly beginning in the right nostril of a patient with chronic rhinitis and an enlarged middle turbinate with much stuffing of the nostril. Came on like an acute coryza and rapidly developed into an attack of violent erysipelas, spreading to both sides of the face."

J. W. Ingalls, Brooklyn. *A.*—"Necrosis of septum. It is probable that there was involvement of the accessory cavities. (The case came under my care twenty years ago when but little attention was given to the accessory cavities.) In the course of six years she had three attacks of facial erysipelas."

L. R. Ryan, Galesburg. *B.*—*Case I.*—Sister of Charity, aged 30. Acute mastoiditis. Intense pain, moderate fever and swelling. Wilde's incision made. Immediate relief. Patient died in a few days from what the attending physician diagnosed as erysipelas. Ryan saw the case but once. *Case II.*—Woman of 70 years operated upon for senile cataract. Erysipelas developed within twenty-four hours, involving nose, cheeks and forehead. Cornea sloughed and eye was lost. Afterward discovered pus deep in duct, also some involvement of the ethmoid: Case was undoubtedly of nasal origin.

W. E. Casselberry, Chicago. *E.*—Girl, aged 20. Purulent bilateral nasal discharge, polypoid degeneration of both middle turbinals. Puncture and irrigation of antra negative. Frontal

probably negative. Thickening of nasal bridge. History of thirty attacks of facial erysipelas during the past six years, mostly commencing within the right naris and striking through the nasal bridge. All degrees of severity. Bilateral middle turbinectomy, ethmoidal cell curettage. Treatment incomplete, having been interrupted by attack of erysipelas. *A.*—Two cases facial erysipelas which commenced within the nostrils without any special or known antecedent nasal disease. *C.*—Man, aged 55. Sharp-forceps removal of a few polyp-buds from middle meatus, followed within a week by a severe facial erysipelas which commenced in that nostril. Not a pus case before or since, as several years elapsed without the development of any serious degree of ethmoidal or sinus disease. *C.*—Man, aged 40. A case similar to above, but exact details not remembered or recorded.

Unsigned communication from some member of the American Academy of Ophthalmology and Oto-Laryngology, the American Otological Society, or the American Ophthalmological Society. *A.*—Man, aged 63. Acute mastoiditis with erysipelas. Operation. Whole mastoid necrotic. Eruption spread over the whole body twice and half the body the third time. Patient comatose five days. Recovery. *B.*—Operation for acute mastoiditis. Woman, aged 39. Erysipelas commenced on lobe of opposite ear, covered half of head and shoulder, but did not involve the wound or the operated side of body. Recovery. *B.*—Girl of 17. Operation for acute mastoiditis. Erysipelas of opposite side of head. Recovery. *G.*—Case seen in hospital service of a colleague. Frontal sinus opened externally. In six to ten days erysipelas developed.

Hiram Woods, Baltimore. *B.*—*Case I.*—Child. Mastoiditis in course of scarlet fever. Operation followed by erysipelas starting from tragus. *Case II.*—Man, whole head involved third day after operation. *Case III.*—Erysipelas following incision of M. T. for acute otitis media. *Case IV.*—Erysipelas following removal of polypi from external auditory canal. *Case V.*—One case appearing six days after the radical operation for chronic mastoiditis.

Frank C. Todd, Minneapolis. *A.*—Hospital nurse, aged 25. Nov. 20th, 1906, was taken with a severe "cold" in the head characterized by profuse discharge from both nostrils, pain in frontal sinus and region of both antra; fever, general malaise. Dr. Todd called Nov. 24th. Diagnosis, acute sinusitis, frontal

and ethmoidal, with probable involvement of antra. Same day there became manifest erysipelatous eruption which later covered nose, region over frontal sinus and down on to the cheeks for a short distance. Severe attack. T. 105 3/5 F., P. 126. Possible history of previous sinus trouble. Case of Drs. Benjamin and Wright. Discharged cured Dec. 7th.

J. R. McIntosh, St. John, N. B. G.—“I have seen at least two cases of frontal sinus disease looked upon as erysipelatous by others. I regret, however, I could not agree with that opinion in these cases, considering it simply inflammatory and due to repeated subacute attacks of frontal sinus disease. . . . I also know of a friend of mine being treated for some high nasal trouble. Erysipelas followed and death resulted. In this case I know the operator (now also dead) had atrophic rhinitis.”

Chas. N. Cox, Brooklyn. D.—One case of erysipelas following operation for removal of sarcoma of antrum involving also nasal cavity, ethmoid cells and orbital plate. Recovery. Progress of malignant disease seemed to be stayed. Patient lived one and a half or two years and then died of recurrence.

Thos. J. Harris, New York. B.—Erysipelas following upon secondary operation for acute mastoid disease. Erysipelas mild. Did not retard healing or involve wound. D.—Operation upon antrum for disease induced by fibroma of nasopharynx. Erysipelas severe but did not extend beyond face. A.—Repeated attacks of facial erysipelas on side corresponding to diseased ethmoid. Mild in nature.

C. R. Holmes, Cincinnati. C.—Sister of Charity, aged 26. Erysipelas three days after turbinectomy. Patient had a severe chronic ethmoiditis and the operation was necessary to secure space in which to attack the ethmoid. Attack mild. A.—Man, aged 38. Involvement of all cavities on right side, chronic, with acute exacerbations. Operations upon inferior and middle turbinate, ethmoid, frontal and antrum. Mild attack of erysipelas during convalescence. B.—Woman, aged 25. After operation for chronic mastoiditis in which there was extensive destruction of bone. Erysipelas on thirteenth day. Case of average severity lasting two weeks. B.—Woman, aged 67. Operation for severe acute mastoiditis. In forty-eight hours erysipelas rapidly spreading forward from ear. Mild attack lasting three days. G.—Man, aged 46. History of alcoholic excesses. Pansinusitis R. & L. Chronic case with

frequent exacerbations of inflammation in frontals. External operation opening both frontal sinuses during acute attack. Erysipelas followed immediately. Severe attack, lasting two weeks. Corneal ulcer.

C. Barck, St. Louis. *B.*—One case. Emergency operation, without facilities for asepsis or antisepsis. Recovery.

W. Cheatham, Louisville, Ky. *A.*—Three cases, with occasional relapses attributed to small abrasions in the nose. Chronic nasal catarrh with excessive secretion and nasal engorgement.

O. A. Griffin, Ann Arbor. *A.*—Woman, aged 50. Deviation of septum. Enlarged middle turbinated-ethmoidal disease. Developed erysipelas in affected side of nose, which spread to face. Severe case. Recovery with more profuse discharge from nose.

Edw. J. Bernstein, Kalamazoo, Mich. *A.*—Man, aged 50. Good health. Empyema antrum of Highmore due to necrosed molar tooth. Erysipelas made its appearance at lachrymal sac and spread over face. Death in twelve days.

Thos. F. Keller, Toledo. *A.*—Patient, aged 67. Erysipelas following paraffin injection for saddle nose. Excessive hyperemia and dryness of m. m. nose. *A.*—Woman, aged 38. Recurrent erysipelas due to antral disease and rhinitis. Attacks have ceased since operation and cure of antrum.

Geo. F. Keiper, Lafayette. *B.*—Double operation for double mastoiditis. Both wounds infected. Recovery, but with little filling up of mastoid wounds.

Ray Connor, Detroit. *B.*—Girl, aged 11. Double mastoid operation six years previously. Chronic discharge since. Acute abscess. Radical operation done. Eleven days later, skin grafting. Four days later, erysipelas of five days' duration. *C.*—Girl, aged 18. Erysipelas following removal of tonsils and adenoids.

Wm. R. Dabney, Marietta. *A.*—Recurrent erysipelas in man due to chronic frontal, anterior ethmoid and bilateral maxillary antrum disease. Erysipelas always preceded by acute exacerbation of above chronic conditions. After cavity disease had yielded to treatment erysipelas did not recur during life of patient. 12 years. *A.*—One case facial erysipelas in a chronic antral suppuration. *B.*—Erysipelas following operation for acute mastoiditis in which the streptococcus was the organism present in the mastoid. Recovery.

W. F. Mittendorf, New York. *A.*—Has had two or three cases.

D. E. Esterley, Topeka. *B.*—Acute mastoiditis following diphtheria. Simple operation. In a few days erysipelas. Throat greatly inflamed from a secondary mixed infection. Nephritis. Death.

Edgar A. Forsyth, Buffalo. *A.*—Boy, 12 years. Chronic rhinitis. Erysipelas of nose and cheek after acute exacerbation of rhinitis.

F. Park Lewis, Buffalo. *B.*—Erysipelas following mastoidectomy for acute suppurative inflammation. Erysipelas was, at the time, in the hospital, but not in the ward containing this patient.

Wolff Freudenthal, New York. *A.*—One case seen in Germany. Recurrent erysipelas for twenty years due to atrophic rhinitis with crust formation. One or two attacks a year, sometimes severe. Has seen from three to six similar cases in New York. *E.*—"Doubtful case. Lady, 69 years of age, had the ethmoid cells scraped. Two days later she telephoned she had some fever. In spite of this she left for Europe the next day. The nose and part of the face was swollen and red. She died in mid-ocean." Dr. Freudenthal did not see her between date of operation and date of departure.

Horace M. Starkey, Rockford. *B.*—Boy of 15. Mastoid antrum and cells filled with pus. Lateral sinus and dura uncovered, but appeared normal. T. fell to nearly normal and patient did well for two days. Erysipelas supervened and quickly carried off patient by meningitis. Family lived on farm five miles from small town. No other case of erysipelas was known in the region. Dr. Starkey had not seen a case of erysipelas for two years, and his instruments had never been near a suspicious case.

Henry B. Hitz, Milwaukee. *B.*—Woman, 36 years. Acute mastoiditis secondary to influenza. Complete ablation of tip and zygomatic cells. Abscess cavity located in tip close to the junction of apophyses with squamous portion. It contained a pure culture of streptococci. Four days after operation erysipelas developed and extended over face, head, neck, back, to buttocks, and down left arm. Recovery. *D.*—One case, chronic. Antrum full of pus and caseous matter and necrotic polypi. Radical operation. Mild attack of erysipelas involving right side of face.

J. G. Dorsey, Wichita. *A.*—Two cases accompanying suppurative otitis media.

E. F. Reamer, Mitchell, S. D. *A.*—Woman of 35. "Coincident with an acute exacerbation of a chronic nasal catarrh."

E. A. Kegley, Cedar Rapids. *C.*—Chronic dacryocystitis R. & L. Successful operation on one sac and duct. Operation on other was followed on third day by erysipelas. Dr. Kegley lost sight of patient, but was informed she had corneal ulcers, which healed, leaving a useful eye.

U. B. G. Ewing, Richmond, Ind. *A.*—Woman had a severe coryza. Abrasions occurred from mopping nose with handkerchief. Erysipelas followed.

Otto J. Stein, Chicago. *A.*—Woman. Acute purulent rhinitis associated with an erysipelas that extended to both sides of the face.

A. J. Knapp, Evansville. *B.*—Female, aged 45. Acute otitis media suppurativa following tonsillitis. Spontaneous rupture. M. T. Mastoiditis. Streptococcus infection. Operation third day. Erysipelas at mastoid wound migrating over face, scalp, neck and shoulders. Recovery. *B.*—Female, aged 12. Case similar in every respect to the preceding one.

H. A. Beaudoux, Fargo, N. D. *C.*—Partial turbinectomy. Patient later fell off his bicycle and sustained a slight abrasion of bridge of nose. Erysipelas followed.

E. E. Foster, New Bedford, Mass. Operation for chronic purulent ethmoiditis. The second day after operation, swelling occurred on the side of the head operated upon, and temperature rose to 104, where it remained for 24 hours, when it rapidly disappeared, as did the swelling. Doubtful case.

J. A. Huizinga, Grand Rapids. *A.*—Attempt to dislodge a piece of dried mucus from the nose with a hairpin. Erysipelas followed. Severe case with meningeal irritation. *B.*—Erysipelas following mastoid operation. Original source of infection may have been external auditory canal before case was operated upon.

Ernest V. Buskman, Wilkesbarre. *B.*—Three days after a mastoid operation on the right side, erysipelas developed in the left ear and left side of face. The wound did not become infected.

F. Vinsonhaler, Little Rock. *A.*—One case originating in pustule in tip of nose. *B.*—One mild case two weeks after

operation. C.—One case following cauterization of inferior turbinate.

H. Gifford, Omaha. C.—Man. Sunken nose bridge. (History negative and symptoms of lachrymal obstruction on left side.) A large probe, No. 11 or 12, was passed directly from the tear sac into the nose with very little resistance. The inner wall of the lachrymal depression evidently was gone. This was immediately followed by a severe attack of erysipelas, spreading from the inner angle of the eye. When this was over the man had no further trouble with lachrymal obstruction. 10-12 years.

W. K. Rogers, Columbus, O. B.—Erysipelas developed about one week after an operation for mastoid empyema with septic sinus thrombosis, involving deep ligation of the internal jugular. The petrosal sinuses had also been infected and there developed a large retropharyngeal abscess. During convalescence a catarrhal appendicitis and pleurisy, with effusion, developed. C.—One case following simple tonsillotomy.

Chas. H. May, New York. B.—One case following operation for acute mastoiditis. Ward case in Mt. Sinai Hospital ten years ago. Details unobtainable. C.—Man. Alcoholic history. Chronic dacryocystitis. Exsection of lachrymal sac. Twenty-four to forty-eight hours later erysipelas developed, starting from the region of the wound. Meningeal symptoms and death. Mt. Sinai Hospital.

T. W. Moore, Huntington, W. Va. A.—One case following abrasion of the lip.

J. Leslie Davis, Philadelphia. A.—Two cases originating from an ulcerated lesion on anterior nasal septum. In both cases the patients had been picking at the irritated crusted spots, and with the facial swelling there was a coexistent acute swelling of the nasal mucous membrane which subsided with the clearing up of the facial symptoms.

Francis P. Emerson, Boston. A.—1901, September 12th, Mrs. C. H. S., aged 53. Left facial erysipelas subacute, 1902. October 2d, left facial erysipelas subacute. Distinct history of left supraorbital pain at intervals for two years becoming more frequent. Examination showed a polypus between left middle turbinal and outer wall. Spongy tissue about nasofacial duct and some crusting. Patient had used finger in naris. Removing polypus and opening and draining an ethmoidal cell cured the case. No recurrence of erysipelas in five years.

S. L. Ledbetter, Birmingham. *A.*—Two cases. Males, suffering from catarrhal conditions. Erysipelas started in nose, spread to face. In both cases perhaps infection from finger. Recovery. *A.*—One case. Male, aged 70. Erysipelas began in nose, spread to face, head, neck. Edema of glottis. Death. *A.*—One case. Female. Chronic ethmoiditis. Recurrent erysipelas. Ethmoid cells cleaned out. Erysipelas has not returned for one year. *C.*—Male, about 34 years. Septal operation by another physician. Erysipelas began in nasal orifice extending to face, scalp and chest. Recovery.

Edw. J. Brown, Minneapolis. *A.*—Mrs. W., aged 53 years. Erysipelas of forehead and cheek following right acute dacryocystitis. Nasal suppuration. *A.*—Fred C. S., 32 years. Erysipelas below right auricle following purulent inflammation in floor of external canal. Right middle turbinal degenerated and polypoid and sinus suppuration for years.

L. E. Maire, Detroit. *B.*—One case following operation for purulent mastoiditis. Recovery.

W. H. Merrill, Lawrence, Mass. *A.*—Erysipelas began on inner margin left lower lid after phlegmonous inflammation of left nostril had existed two days. *A.*—Two cases where infection began in nasal vestibule. End of nose and nasal mucous membrane involved and in forty-eight hours empyema of the antrum of Highmore. *B.*—Three cases. Acute streptococcus infection of middle ear and mastoid. Marked swelling and edema before operation. Erysipelas followed operation in twenty-four hours. Recovery.

J. F. Byington, Battle Creek. *B.*—Woman. Acute mastoiditis. Bacteriological examination at the time of operation showed streptococcus infection. Severe erysipelas followed on evening of second day. No intracranial involvement. Operation performed in new operating room and neither operator or assistants had seen a case of erysipelas for a long time. The infection was evidently from the pus in the mastoid antrum. Death on eighth day.

Wm. Merle Carhart, New York. *A.*—Erysipelas followed infection of the nose by an acute process involving the ethmoid cells and entire nasal cavity of one side. Infection was at first a staphylococcus process of virulent type.

Guy L. Noyes, Columbia, Mo. *A.*—Woman, aged 30. In the forty-eighth day of typhoid. Loss of hearing due to Eustachian occlusion. The mucous membrane of the nose and

pharynx were dry and covered with crusts which left bleeding areas when detached, as is usually seen in typhoid. Catheterization of tubes, inflation of middle ear without satisfactory results. One week later acute suppurative otitis media R. & L. Three days later facial erysipelas. Death on fifty-fourth day of typhoid.

L. D. Brose, Evansville. *A.*—Male, aged 36. Perforating ulcer of septum. Erysipelas spreading from ala nasi. *C.*—Male, aged about 45 years. Acute exacerbation of hypertrophic nasal catarrh. After an application of the galvano-cautery to the right inferior turbinated body, had a severe attack of facial erysipelas. Recovery with an active perforating ulcer of the septum.

Chas. H. Baker, Bay City. *A.*—Male, aged 45. Chronic scabbing left septum. Eczematous crack in vestibule. Facial erysipelas that side of face starting at the crack. *B.*—Three cases four to seven days after operation. Mild attacks. One case, severe attack followed by severe eczema of head and body. Recovery.

Albert E. Bulson, Jr., Ft. Wayne, Ind. *A.*—Case of coryza from influenza complicated by erysipelas. *B.*—Acute exacerbation of a chronic suppurative otitis media. Radical mastoid operation. In forty-eight hours facial erysipelas, beginning at the mastoid wound. Recovery. Another case somewhat similar but milder. *C.*—Erysipelas following application of electro-cautery to the inferior turbinal. Has never had two or more cases in succession and does not know that any of his cases contracted the disease from other cases of erysipelas in hospitals or anywhere else.

W. E. Sauer, St. Louis. *C.*—Female, aged 28 years. Four days after submucous resection of the septum erysipelas of four weeks' duration. Recovery.

Eugene Smith, Detroit. *B.*—Erysipelas of vicinity of wound and scalp of several days' duration following operation for acute disease. Recovery. *B.*—Erysipelas, severe, following operation for chronic disease in poorly-nourished patient. Recovery.

M. V. Ball, Warren, Pa. *A.*—Man, aged 40. Erysipelas originating in furuncle of nose. Infection from finger picking crust. Recovery. *A.*—Man, aged 35. Good history. Infection from a small furuncle in nose. No disease of nasal chambers known previously, pneumonia, septic, delirium, both

orbits immensely swollen and erysipelatous inflammation of skin over forehead and lids. Death in three days from general pyemia and thrombosis of cavernous sinus.

S. E. Allen, Cincinnati. *B.*—Two cases following operation for acute mastoiditis. Both severe—inflammation extending over entire head. After recovery mastoid wounds healed with marked rapidity.

D. T. Vail, Cincinnati. *A.*—One case pansinusitis, right. Recurrent attacks of erysipelas. Finally carcinoma of right upper jaw. *B.*—Boy, aged 11. Operation for acute mastoiditis. Severe erysipelas. T. 105 F. for 10 days. Great pain. Endocarditis. Recovery.

E. E. Mather, Akron. *A.*—One case. Nose had been squeezed. Abscess of cartilaginous septum resulted. Facial erysipelas. T. 104 F. Recovery. *B.*—Babe, 10 months old. Acute mastoiditis. Erysipelas developed within twenty-four hours after operation and ran a severe course. Recovery.

J. Walter Park, Harrisburg. *A.*—Woman, aged 43 years. In the past fifteen years has had three attacks of facial erysipelas always following a severe coryza. Would generally come on after resolution had set in when she was blowing a profuse purulent discharge from the nose. There is no sinus disease.

W. G. Craig, Springfield, Mass. *B.*—*Case I.*—Nurse, aged 26. Ot. med. pur. ac. post-tonsillitis. Operated upon in hospital. Erysipelas on fourth day, side of face and neck. Mild attack. Recovery. *Case II.*—Woman, aged 65. Acute mastoiditis following la grippe. Lived five miles in country. Operated upon at home. Erysipelas very severe fourth day. Unable to account for infection. Neither family physician, nurse nor Craig had seen or attended a case of erysipelas for six months. Recovery slow but perfect.

J. A. Stucky, Lexington, Ky. *B.*—Four cases. Females between 30 and 60 years of age. Operation for chronic mastoiditis. *E.*—Three cases following operations for extensive suppuration with great destruction of bone—all were females. While temperature was high, 104-105 F., all recovered. *G.*—Woman, aged 41. Cause attributed to overlooked infected ethmoid cell which infected operative area on fourth day. Severe attack. Recovery.

Cornelius G. Coakley—New York. "I have had it (erysipelas) in frontal sinus cases and have had it in mastoid cases,

and I also believe that the lack of resisting power of the patient has considerable to do with any individual case."

Robert Sattler, Cincinnati. *B.*—Operation for chronic mastoid inflammation. Woman, aged 40. Erysipelas of face and neck developed five days after operation. Recovery. (Hospital case.) *C.*—Extensive disease of anterior ethmoidal cells, middle and lower turbinal associated with blenorrhea of tear sac. Operation on tear sac and nasal duct followed by erysipelas of face and scalp. Two subsequent attacks without surgical interference since then. In good health now but has a purulent discharge from the nose and some discharge from sac. *C.*—One case of extensive epithelial carcinoma of the orbit invading also the frontal, ethmoidal and maxillary sinuses. On the sixth day following surgical intervention, erysipelas of face, scalp and neck. Death one and one-half year afterward from erosion of the dura. Operation performed at home of patient.

Victor Ray, Cincinnati. *B.*—Operation for acute mastoiditis. Woman in bad condition when she entered hospital. Violent attack, but recovery without serious damage.

Geo. P. Marquis, Chicago. *A.*—One case of erysipelas complicating an otitis media.

Huntington Richards, St. Paul's School, Concord. *A.*—Erysipelas in course of chronic mastoid disease in small negro child seen at Vanderbilt Clinic, N. Y., about fifteen years ago. Severe attack. Recovery.

Jas. F. McKernon, New York. *B.*—Four cases erysipelas after operation for acute mastoid disease.

1st case developed 24 hours after operation.

2nd case developed 12 hours after operation.

3rd case developed 2 days after operation.

4th case developed 3 days after operation.

All adults. All were clinic cases. Three of them neglected cases and the disease had progressed for weeks.

L. R. Culberston, Zanesville. *A.*—Eight cases mild facial erysipelas resulting from dacryocystitis due to nasal infection of sac, in all probability. Recovery without lesions in all but one case. *B.*—1. Child of 6 years. Erysipelas following operation for acute mastoiditis. 2. Man of 62 years. Alcoholic. Erysipelas after operation for acute mastoiditis. Severe case. Death.

Geo. B. McAuliffe, New York. *C.*—Erysipelas following

removal of ecchondrosis near the vestibule on right side. Erysipelas was mild and only spread over part of face. Appeared two days after operation and lasted four days. Operation was aseptic and infection was apparently independent of the procedure.

J. F. Klinedinst, York, Pa. *B.*—Man, aged 30. Pain in ear four days, followed by puro-sanguinolent discharge. Profuse discharge of pus. Auricle covered with a number of small pustules, red and swollen. Mastoiditis. Operation. Pus in antrum, no disease of bone. In twenty-four hours erysipelas developed in neighborhood of ear. Extended to mastoid wound and opposite side of face. Unusual aseptic care in operative measures. Infection probably present at time of operation.

J. M. Ray, Louisville. *A.*—Two cases of empyema of the antrum of Highmore. Had been operated upon and the operation wound had healed and the patients were wearing tubes in the canine fossae. One case of erysipelas came on several weeks after operation, the other case six or eight months. Inflammatory process started about the nose and inner angle of the eyes. *B.*—No personal experience with acute disease, but when a hospital interne saw two or three cases develop after operations for acute mastoiditis. One case following a radical operation for chronic disease. Inflammation started around the ear, but got well promptly without infecting the wound. Incision healed per primam.

Chevalier Jackson, Pittsburg. *A.*—Man, aged 27. Three attacks of facial erysipelas, starting on bridge of nose, left of median line. No attack to date since curettage of necrosing ethmoiditis three years ago. *A.*—Man, aged 40. For five years had semi-annual attacks of facial erysipelas starting in various locations. No attack for two years since radical treatment of pansinusitis. *F.*—Fatal facial erysipelas starting under right eye and extending all over upper face and scalp. Commencing on first day and ending on fifth day after evacuation of sphenoidal sinus, in a man 28 years of age.

W. K. Butler, Washington, D. C. *A.*—Following operation for acute disease, facial erysipelas developed extending to but not involving wound. Recovery. Private patient in private room in hospital. No history of contagion could be traced.

H. M. Fish, Chicago. *A.*—*Case I.*—Young woman. Brawny swelling of left orbital region—lids, cheek, root of nose—that made it nearly impossible to open the eye. The condition was

diagnosed erysipelas by a physician. Pain over frontal sinus. Fundus normal. No exophthalmos or ophthalmoplegia. Syringing a mucopurulent secretion from the frontal sinus restored conditions to normal in a few days. *A.—Case II.*—A woman came with left facial erysipelas that appeared two days before. Lids greatly swollen—could not be opened. Marked tense edema of supraorbital region and root of nose. Lower lid and cheek raised almost to level of ridge of nose. Skin tense, glistening; blebs. No ocular involvement. Syringing the sinuses. Restoration to normal in five days. *C.—Case III.*—“Several years ago while in Vienna I removed some large polypi, the nostril being acutely and markedly congested. I plugged the nostril and the following day there was an erysipelas of the root of the nose, cheek and lids of corresponding side. The plugs were removed, revealing a free flow of pus. The patient was not seen again.

J. W. Murphy, Cincinnati. G.—Case I.—Man, aged 26. Operated on for chronic empyema right frontal sinus and antrum. Five days later erysipelas involving entire head. *B.—Case II.*—Girl, aged 2. Operation for acute mastoiditis. Five days later erysipelas developed in wound.

T. Passmore Berens, New York. A.—“I have had but one case of facial erysipelas which could be attributed with more or less positiveness to the nose. This case was one of chronic ethmoiditis of the anterior cells complicated with a general atrophic (ozoanatus) rhinitis. This particular case had four attacks of facial erysipelas, one attack starting in the inner canthus of one eye and the three other attacks starting in a fissure in the vestibule of the nose. These attacks occurred some ten or twelve years ago. The patient has had no attacks for more than eight years. The treatment of the ethmoid has resulted in a cure of his nasal condition, excepting, of course, that the membranes are still atrophied.” *B.*—“In the last four or five years I have seen certainly six cases that I can recall (and there was probably more) in which facial erysipelas of a severe type developed following operation for acute mastoid disease. These cases included both hospital and private practice. It may be not unwise to state that the operations were all performed under rigid asepsis. All of the cases mentioned recovered without serious injury resulting.”

J. Holinger, Chicago. A.—One case of erysipelas due to acute suppuration of the ear. *B.*—One case of erysipelas fol-

lowing the radical operation for chronic mastoiditis. The erysipelas spread over the back and a large part of the body and the patient died.

Unsigned communication from some member of the American Laryngological Society, the American Otological Society, the American Academy of Ophthalmology and Oto-Laryngology, and the American Ophthalmological Society. *B.*—Woman, aged 56. Erysipelas following upon operation for acute mastoiditis in a small, dirty house. Recovery. *B.*—Erysipelas following upon operation for acute mastoid disease in hospital.

Chas. M. Robertson, Chicago. *B.*—"Woman, aged 27. Chronic suppurative otitis media since 12 years of age. Right ear operated on for radical mastoid Feb. 14th, 1905. Packed wound with iodoform strips. Following day iodoform dermatitis seen on pinna. Gauze removed and plain sterile gauze used. Erysipelas began in two days, extending over face to median line. Streptococcus infection in right leg, knee and ankle joint. Given serum twice daily for ten days. Drained leg and knee joint by aspiration of joint and free incisions in leg, separating muscles and washing out with salt water. Recovery of face in 11 or 14 days. Knee stiff as result. Broken up one year after, but no permanent result."

J. E. Gleason, Detroit. *A.*—"Man, aged 58. Had erysipelas five or six times at varying intervals. Was operated upon for chronic suppuration antrum of Highmore nearly two years ago. No attack of erysipelas since. *B.*—Woman, 44 years. Culture taken from ear at time of paracentesis made a few hours after first symptoms appeared showed streptococcic infection. Operation for acute mastoid disease six days after paracentesis. I would differentiate between erysipelas and streptococcic skin infection clinically. This case was of the latter variety."

W. A. Dietrich, Chattanooga. *C.*—Removed a septal spur from a saloonkeeper. Erysipelas three days later. Patient was a hard drinker—from 1 pint to 1 quart of whiskey a day. Recovery. Nine months later removed middle turbinated from same patient without ill results.

A. B. Thrasher, Cincinnati. *A.*—Woman, aged 30. Tumor inferior turbinate. Used galvano-cautery. In a few days facial erysipelas. Recovery. The patient had had a previous attack of facial erysipelas of unknown origin. There

was a possible involvement of anterior ethmoidal cells. *B.*—Erysipelas three weeks after opening mastoid antrum for acute mastoiditis while the patient was apparently doing well. Patient made a good recovery and the healing of the mastoid wound did not appear to be much hindered.

J. A. Thompson, Cincinnati. *A.*—Four cases of primary erysipelas of nose and throat. Condition of sinuses not determined. *B.*—One case erysipelas following upon radical operation on an ear that had suppurated for twenty-seven years in which the external wound was closed at the time of operation. Recovery. *C.*—Erysipelas of face and scalp after removal of septal spur. Patient a syphilitic railroad man who had had erysipelas every time he was injured. *D.*—Brewery collector in bad physical condition from drink. Erysipelas of face, neck and scalp following operation upon ethmoid cells. Recovery.

E. Fletcher Ingals, Chicago. *C.*—"Just one case in which facial erysipelas twice followed the use of menthol—about gr. v to one ounce of liquid albolene."

John H. Kincaid, Knoxville. Man, aged 42. Acute ethmoiditis right and left. Erysipelas beginning at the orifice of both nasal fossae. In twenty-four hours had involved surface of nose, cheeks, forehead and ear. "There was no doubt in my mind but that the erysipelas could be directly traced to the ethmoidal disease."

James B. Clemens, New York. *B.*—Following operation for acute mastoid disease. "In one case out of about 250 operations. Usual acute symptoms and local conditions in girl of 19 years. Erysipelas developed about fifth day, two days after the first mastoid dressing. It ran an uneventful course."

Jonathan Wright, New York. *A.*—Three cases erysipelas starting over the bridge of the nose. Were practically all due to nasal infection or rather post-nasal, which regularly holds the streptococcus awaiting a favorable systemic condition. *C.*—One case of erysipelas following upon nasal operation in a case of chronic nasopharyngitis.

James E. Newcomb, New York. *A.*—Has "seen two or three cases of erysipelas due to infection from abrasions in the nasal vestibule."

C. F. Theisen, Albany. *A.*—"One case of recurring facial erysipelas complicating a chronic empyema of the frontal sinus. Woman about 45 years of age. I have no doubt but that in

this case the frontal sinusitis was the etiological factor in the facial erysipelas." C.—One case following a cauterization of the inferior turbinate in a young lady. No sinus disease.

J. S. Prout, Brooklyn. A.—Facial erysipelas which seemed to result from a leech bite in acute middle ear inflammation. No mastoid involvement."

Allen Greenwood, Boston. A.—"One case of facial erysipelas following acute disease of frontal sinus. After recovery from the erysipelas the frontal sinus was obliterated by operation."

H. Bert Ellis, Los Angeles. A.—Sailor, aged 54 years. Under treatment for dacryocystitis exchronic hypertrophic rhinitis. Erysipelas developed left side of face about left eye. Severe case. Panophthalmitis. Antistreptococcus serum. (See also ocular complications of facial erysipelas.) A.—Man, aged 25. Hypertrophic pharyngeal catarrh. Long narrow strip of mucous surface raw and covered with secretion. Application AgNo 3. In twenty-four hours condition improved. Twenty-four hours later facial erysipelas. Recovery. B.—Woman, aged 26. Acute rhinitis. Acute otitis media suppurativa. Strepococci in both nasal and ear secretions. Operation. Patient did well. Three weeks later erysipelas. Severe case. "The erysipelas most complete involvement of the entire body I have ever seen." Antistreptococcus serum. Recovery.

Wm. E. Gamble, Chicago. B.—Man, aged 58. Dec. 18th, 1906, removal of inspissated cerumen by family physician. Three days later Gamble found otitis media suppurativa, with perforation M. T. Five days later mastoiditis. Operation. For two days high and irregular temperature. Then erysipelas developed over nose and cheeks. Jan. 8th, 1907, leucocytosis 23,400. Jan. 12th, leucocytes 6,800. Gamble explains: "Sudden rise of temperature with pronounced rigors and cyanosis and extreme leucocytosis as due to streptococci entering the blood in numbers not sufficient to overpower the leucocytes, being themselves overpowered."

H. B. Gratiot, Dubuque. A.—Two cases of erysipelas occurring in connection with acute otitis media, but not following operations.

L. L. Doane, Butler, Pa. A.—"Female, married, aged 40. Hypertrophic rhinitis. Subject to attacks subacute bronchitis, also to fissuring left ala nasi. Erysipelas began near left inner canthus (might have begun at nose). Severe attack. Re-

covery. C.—Male, clerk, aged 20. Saw operation for removal of septal spur. Much hemorrhage. Plugged posteriorly. Two days later mild attack facial erysipelas.

F. L. Waite, Hartford. B.—“Two cases of erysipelas appearing on the third day after operation—one very severe. Both males. Good recovery.”

K. K. Wheelock, Fort Wayne. B.—Medical student, aged 23. Double mastoiditis post-influenza. Double operation in comparatively new and excellent hospital. Three days later rise in T. to 104.8 F., followed by erysipelas appearing over left malar bone. Erysipelas spread widely but did not attack wounds. Severe case. “I attributed the site of infection to be the nasal cavity.” B.—Woman, aged 64. Chronic abscess upper inner angle of orbit. Necrosis ethmoid cells. Following operation patient had a mild attack of erysipelas.

John M. Ingersoll, Cleveland. A.—“One case of repeated attacks of facial erysipelas in a woman who had nasal polypi for a number of years and an infection of both antra, both frontals and all of the ethmoidal sinuses. The removal of the polypi and the treatment of the sinuses stopped entirely the attacks of facial erysipelas. A.—Attacks of facial erysipelas in a man who had an infection in the right maxillary and the frontal sinuses. Treatment of the sinuses cured both conditions. A.—Two cases of repeated attacks of facial erysipelas in atrophic rhinitis without involvement of the sinuses. Both cases were cured of erysipelas and the nasal condition improved by treatment. D.—Operation for chronic maxillary sinus infection followed by erysipelas. Cultures from the antrum gave almost pure streptococci. The attacks of erysipelas complicated matters somewhat, but the patient recovered completely from both conditions.”

J. H. Bryan, Washington. A.—One case of facial erysipelas occurring in a case of syphilis of the nose, the case being one of extensive necrosis of the nasal septum. The inflammation starting within the nose extended to the outer surface and became general over face and scalp. B.—One case following operation for acute suppurating mastoiditis occurring on the second day. The inflammation became general, affecting the face and scalp. A.—One case occurring in the course of chronic disease of the frontal sinus. Owing to a relapse following the first operation on the sinus the cavity had to be reopened and was treated by the open method. In conse-

quence of patient having to spend some time on railroad trains the wound became infected. The inflammation extended from the sinus wound and involved the whole face and scalp.

John Clarence Blake, Boston. *B.*—Cases of erysipelas “originating apparently apart from the mastoid wound, as in one instance on the vertex in a case in which the mastoid wound healed by first intention without subsequent disturbance, and in others in which the starting point of the local symptoms was on the face.”

Henry L. Swain, New Haven. *C.*—Erysipelas following cauterization (of the nose) in a man of 67. *C.*—Erysipelas following the removal of an exostosis in a case in which it was discovered that there was a concealed or latent ethmoiditis, discharging pus from an anterior cell. *B.*—Six or eight cases following mastoid operations. All hospital cases but one. This latter had the disease start from a leech bite which had its bleeding staunched by cotton taken from the wadding of an old and diseased coat. *A.*—“Since receiving this note a patient in a family where I am attending an acute ear case has developed an attack of erysipelas which apparently commenced in the spot on her nose where her eyeglasses rest. One previous attack three years ago.”

B. Alex. Randall, Philadelphia. *A.*—“Young blacksmith with acute otitis media purulenta, whose canal wall posteriorly had a fistula. Erysipelas developed without operation.” *A.*—Erysipelas developed in an operated cataract case although her nose had been gotten into decent condition previously by mild measures. *A.*—Erysipelas occurred in the course of a case of otitis media purulenta.

J. Price Brown, Toronto, Can. *C.*—One case of facial erysipelas following cutting operation upon the nasal septum. Recovery. *C.*—One case of facial erysipelas following electric cautery operation of an inferior turbinal. The condition for several days was very serious. *D.*—One case innumerable nasal polypi right and left. Removal very freely by snares was followed two days later by erysipelas, death occurring in one week. The patient had been greatly exposed to cold and wet after operation. Family physician later informed Dr. Brown that the patient's father died after an operation upon the nose of a similar character followed by erysipelas.

E. S. Ferguson, Oklahoma City. Doubtful case. *A.*—Septal spur on right side impinging upon inferior turbinal.

Removal. Recovery. Three weeks later abrasion of helix of ear. Severe erysipelas developed and covered two-thirds of body.

John A. Donavan, Butte. *A.*—Three cases in men, recently. All had had previous nasal trouble. Inflammation of sinuses not determined but probably present. *C.*—One case erysipelas, woman of 22, following removal anterior end of middle turbinal. *C.*—Saw one case erysipelas follow an operation on frontal sinus while a student at Ann Arbor.

Joseph A. Andrews, Santa Barbara. *A.*—Young man while boxing was struck on nose. Abrasions but no fracture of bones could be detected. A few days later erysipelas. Orbital cellulitis. Exophthalmos. Death in a few days of meningitis. *A.*—Man, aged 71. Furuncle external auditory canal. Incised. Two days later perichondritis auriculæ and erysipelas of face and head. Recovery.

W. Peyn Porcher, Charleston. *A.*—Mastoiditis in an old diabetic subject in which the pus worked its way out above the zygomatic process. Erysipelas followed. Recovery. *B.*—Erysipelas following a secondary mastoid operation affected the whole head, but did not involve the wound itself. Severe case. Recovery.

John R. Winslow, Baltimore. "Woman, about 65. Difficulty in swallowing due to paralysis of pharyngeal constrictors. Velum, palati unaffected. History: Severe 'cold' followed by membranous tonsillitis and middle ear infection; subsequently had typical outbreak of facial erysipelas. Streptococcus infection."

J. Payson Clark, Boston. *C.*—"One case of marked facial erysipelas in a child of 10 or 12 years, following immediately on an adenoid operation. Following this there were one or two other cases coming on after operations on the nose or throat at the same clinic." Antisepsis for the rooms and temporary abandonment of operations.

Joseph C. Beck, Chicago. *A.*—"Four cases, all in women. All had fissures at external nares and usually at the menstrual period an edematous surface of the face would occur, last for a few days and then disappear again. No, or very little, temperature and if fissures were healed up and intranasal treatment instituted (there was usually some malformation present) patients remained well." *C.*—Woman, aged 43. Complete filling up of left nostril with myxomatous polypi. Removed.

Facial erysipelas followed with blebs. Cultures showed streptococcus infection. Recovery.

F. E. Hopkins, Springfield, Mass. *A.*—"Two cases of facial erysipelas secondary to infection within the nose. Both were cases of atrophic rhinitis with much crusting of mucus on the septum. The septum was excoriated from the frequent removal of the crusts and with each removal there was nearly always more or less bleeding. In both cases it is probable that infection was conveyed by the fingers. The first patient was a gentleman about 60, a literary man, the second a housewife about 50." *B.*—Marked cellulitis, following mastoid operation involving half the surface of the head. Patient a child of 2½ years. Marked constitutional symptoms. T. 104 F. Iodoform gauze was the initial dressing. The cellulitis promptly subsided with the substitution of plain sterile gauze.

Wendell C. Phillips, New York. *B.*—Has had a number of cases (cannot remember how many in all) following mastoid operation for acute disease. "Three during the present winter, all following the mastoid operation by about five days. All recovered." In chronic disease of the mastoid "one in my service at Post-Graduate Hospital following a flap operation. Recovery."

Thos. R. Pooley, New York (through E. H. Gaudineer, House Surgeon, New Amsterdam Eye & Ear Hospital). *B.*—" (1) Age 28. Operated for acute mastoiditis June 5th. Discharged to return for dressings June 29th. Returned July 8th with erysipelas facialis. Treated locally and constitutionally for two days and then sent to Bellevue Hospital. (2) Age 72. Otitis media purulenta acuta and acute mastoiditis. Operated upon Nov. 29th. Sinus exposed. Next day edema of eyelids and ocular conjunctiva. Dec. 1st, erysipelas facialis. Wound dressed. Treatment local and general. Dec. 2nd, patient worse. Mastoid wound and sinus infected. Treatment continued. Wound dressed daily, but patient continued to weaken. Dec. 13th, patient died of exhaustion, septicemia and erysipelas following mastoid operation."

G. A. Leland, Boston. *A.*—"Occasional cases of facial erysipelas where port of entry seemed to be cracks at the orifices of the nares, ceasing after cracks were healed." "Disease of antrum of Highmore. (1) Male, 35 years. Blow (fracture?), right superior maxilla. Redness and swelling (erysipelas?) right malar region; delirium tremens; discharge from nose.

Caldwell-Luc operation. Recovery. (2) Boy, 4 years. Great redness and swelling right cheek. Rhinitis purulenta (probably specific). Operation canine fossa (Janson) K. I., etc. Recovery." *B.*—Mastoid operation for acute disease. "Several. Recovery not retarded in one. Antistreptococcus serum seemed to control the disease. One woman of 45. Erysipelas followed in few days after operation in private hospital. Recovery in public hospital to which she was sent. Left hospital and in a week or so was back with second attack of erysipelas. Wound healing about as usual." Mastoid operation for chronic disease. "Several. One girl 19. Antistreptococcus serum was followed by nearly normal temperature in about twelve hours." Leland closes his report with the following comments: "In a large municipal hospital, where most of my cases are treated, attacks of erysipelas are not so very uncommon. It hasn't seemed to me that these attacks were in any way due to the location of the operation and in some cases the erysipelas may develop before the mastoiditis necessitates operation, and facial erysipelas frequently simulates mastoiditis when behind the ear, so that occasionally cases are sent in with diagnosis of mastoiditis, for operation, when there is no involvement of the bone."

Louis J. Goux, Detroit. *A.*—"One case of facial erysipelas which I believed to be due to infection through ulcerated area on septum in right naris. The case was further complicated by an acute attack of double otitis media."

Emil Amberg, Detroit. *A.*—"A very severe erysipelas after or accompanying a double otitis media in a physician's wife. . . . I thought at that time that the fact that chloroform was administered for the double myringotomy without protecting the skin with vaseline might have been responsible to some extent for the complication."

Chas. W. Richardson, Washington. *B.*—"The only cases of erysipelas I have had are in connection with the operation on the mastoid. All these resulted from too great effort in the cleansing of the mastoid before the operative intervention, thus denuding the particular surface over and about the mastoid. The flowing of the bacteria-laden pus over this surface gave rise to the erysipelas which ensued. Since I have ceased the vigorous cleansing of the mastoid I have had no cases of erysipelas, thus apparently proving my conjecture as to the cause."

A. Coolidge, Jr., Boston. *A.*—"I have for some time looked upon facial erysipelas starting from the region of the nose as

due to intranasal or vestibular infection, although often no point of infection within the nose can be proven. Without having any records at hand I should say that in many cases of facial erysipelas there is to be found a marked septic condition in the nasal vestibule or vicinity. *C.*—A severe facial erysipelas developed a few days after I had opened a foul antrum through the inferior meatus. The erysipelas started near the ala on the same side."

Chas. J. Kipp, Newark. *A.*—"I have had a number of cases of otitis media purulenta in which facial erysipelas developed while there was otorrhea. The erysipelas started from the external meatus and traveled over the face and neck." *B.*—Cases of erysipelas following operation for acute and chronic mastoiditis. Unable to give numbers. All recovered.

Hanau W. Loeb, St. Louis. *C.*—A patient developed erysipelas ten days after a spur operation. He had failed to present himself regularly for observation. Recovered.

Walter J. Freeman, Philadelphia. *A.*—"In my hospital experiences it was quite common to have patients having had frequent attacks of erysipelas. . . . One case of atrophic rhinitis now under treatment gives a history of repeated attacks of erysipelas before treatment a year ago, but none since then."

F. L. Knight, Boston. *C.*—"The only case of facial erysipelas I remember occurred in a patient during an acute inflammation in the antrum. She has since had one acute exacerbation of the antrum disease (without erysipelas), which quietly subsided, she declining operation."

Wm. C. Bane, Denver. *A.*—"Woman, aged 34. Tuberculous subject. Acute double otitis media and mastoiditis. Streptococcic. Operation on right mastoid seventh day. Not much involvement. Erysipelas third day after operation. Pleurisy fourth day. Death seventh day after operation. No attempt at repair in wound."

J. E. Sheppard, Brooklyn. *B.*—"A considerable number of cases of erysipelas following mastoid operation for acute disease. All did well save two—one, a diabetic, mastoid wound nearly healed, infected by general practitioner fresh from a case of puerperal sepsis; died finally from meningitis. The second, an elderly woman, died in almshouse after leaving my care."

Francis W. Alter, Toledo. *C.*—"Recently, I resected a de-

flected septum nasi and for a week thereafter patient did well, but at that time he came down with a well-defined attack of erysipelas, which evidenced itself first over the dorsum of the nose. I thought at first that he was in for an abscess because of its circumscribed character, but soon the other symptoms of erysipelas appeared. . . . There seemed at no time to be any retardation of the healing process." After a week, recovery.

John W. Farlow, Boston (in addition to cases cited in the text). *E.*—Man, 70 years. Nasal polypi and polypoid degeneration in right ethmoid region. Removal of polypoid tissue with cold snare; considerable bleeding; gauze packing; marked facial erysipelas starting on same side of nose the next day. Recovery.

Sargent F. Snow, Syracuse. *C.*—Two cases, one private and one public hospital, in which erysipelas followed operation on nasal septum. The origin of erysipelas in private case unknown; of the hospital case, "was clearly from the infection that existed in the ward."

Henry Manning Fish, Chicago (in addition to previous communication): "A day or two after writing you I was allowed to examine a patient of Dr. J. H. Cook, who was suffering from facial erysipelas covering the entire face, head and ears. There was a distinct history of an acute right maxillary empyema four years before, with spontaneous discharge through the nostrils. About ten days before I saw the patient, following influenza, she had another attack of right maxillary empyema, intense pain, swelling of the cheek, etc., with subsidence after a profuse right nasal discharge. A few days later erysipelas appeared at the root or bridge of the nose, spreading therefrom as mentioned above. When I saw the patient she was desquamating and numerous blisters on the face and scalp had dried up; the fever had subsided and she was convalescing. . . . I took one culture from pus on the floor of the nostril and a second one from pus in the right middle meatus. Dr. Gehrmann, of the Columbus Medical Laboratory, reports streptococcus in each culture."

Francis R. Packard, Philadelphia. *A.*—"I have seen two cases of erysipelas occurring in both instances in adult males, involving the side of the face and originating in what seemed to be a furunculosis of the nasal vestibule. *B.*—I performed a Schwartze-Stacke operation upon an Italian at the Pennsyl-

vania Hospital for acute mastoiditis occurring in the course of typhoid fever. The operation was performed upon the thirty-second day of the disease. Four days after the operation erysipelas developed on the side of the head on which the operation had been performed. The resident in charge of the case had been directly in contact with several cases of erysipelas occurring in the hospital. Boy, aged 10. Acute otitis media purulenta left ear. Considerable edema below left mastoid. Mastoid opened—porous and soft—large central cavity containing pus. Four days later developed erysipelas in neighborhood of operative wound. Very ill for four days. Mastoid wound and ear completely healed in four weeks.

Thos. Hubbard, Toledo. A.—“Many of the cases of facial erysipelas that I have seen have had primary or secondary nasal and throat manifestations. In a few the primarily infected area was an excoriation in anterior nares, whence it spread to deeper regions and over the skin. I cannot trace any case to known sinus disease, but have suspected general sinus infection in all severe cases involving nares secondarily. A recent case of erysipelas in an infant, contracted from grandparent who had subacute or chronic type of facial erysipelas, involved throat, nares, face and scalp. Had to amputate uvula on account of obstructed respiration. Streptolytic serum in large and repeated doses kept the youngster alive for four or five days, that is, temperature would drop and symptoms ameliorate temporarily, but death come finally from exhaustion due to persistence of infection and relapses.”

Gordon King, New Orleans. C.—“Have seen one case due to infection of nose following a submucous resection of septal cartilage and another following cauterization of the inferior turbinal.”

B. L. Millikin, Cleveland. A.—“Some years ago I had a case of erysipelas following on an acute attack of middle ear abscess, and was myself infected through the tear duct probably and the antrum of Highmore, but not after any operative procedure.”

G. W. Spohn, Elkhart, Ind. A.—Has had cases of facial erysipelas which he considers due to disease of the nose or its accessory sinuses.

A. R. Amos, Des Moines. C.—“One case developed erysipelas following removal of middle turbinate with scissors and snare. It recovered after a general facial erysipelas of the same side.”

Harris G. Sherman, Cleveland. C.—Woman, aged 34. After galvano-cauterization of the inferior turbinate a violent erysipelas ensued, involving entire head; extended over body. Death four weeks after operation.

W. Scott Renner, Buffalo. B.—Mastoid, acute disease. “Developed erysipelas three days after operation. Complete recovery with no loss of hearing.” Mastoid, chronic disease. “Patient facial paralysis twelve hours after operation and facial erysipelas. Complete recovery from paralysis and erysipelas. Chronic discharge cured.” C.—“Erysipelas developed after the removal of hypertrophied tissue on the lower turbinated bone. Uninterrupted recovery. This patient has had previous and subsequent attacks of erysipelas.” E.—“Patient has ethmoiditis, maxillary sinusitis and nasal polypi. The erysipelas developed after removing polypi. Ran uninterrupted course to recovery.

Arnold Knapp, New York (in addition to cases cited in the text). Pansinusitis. Severe and finally fatal case. After the first operation, attacking the right ethmoid cells and frontal sinus, erysipelas appeared at once with a T. 104 F. While this condition persisted, although the symptoms of sinusitis of the left ethmoid and frontal were urgent, it was thought best to defer opening these cavities. The operation on the left side was not undertaken for a month after that on the right. Osteomyelitis of the bones of the skull and face set in (a streptococcic infection of a low grade intensity), extended to the squamous portion of the right temporal bone, causing an epidural abscess with thrombosis of the sigmoid sinus, pyemia and, notwithstanding active surgical measures wherever pus was suspected, finally caused the death of the patient. (Reported in Archives of Otology, Vol. XXXII, No. 3, 1903.) B.—Two cases of erysipelas following on operations for acute mastoiditis. One case of erysipelas following on operation for chronic mastoiditis.

H. A. Alderton, Brooklyn. B.—A number of cases of erysipelas following operation for acute mastoid disease. A.—“Have just done one operation on a case in which the erysipelas preceded the operative attack; sequence, the grip, ear pain for one week, rupture, seen by me for first time, erysipelas next day, treatment of erysipelas for a week or one and a half weeks, operation showed great destruction but intact inner table. Recovery.” B.—A number of cases following opera-

tion for chronic mastoid disease, "though I think only in acute exacerbations of the chronic trouble and mostly associated with dermatitis of the canal. All my cases have recovered even when the dura was exposed."

Arthur B. Duell, New York. *B.*—After operation acute mastoid disease. "Three cases in clinic. Facial erysipelas. All recovered. Two cases in private practice. Facial erysipelas. Both recovered." After operation, chronic mastoid disease. "Two cases in clinic. Recovered. One in private practice. Extensive, whole of head, chest and back. Desperately ill. Recovered."

Having thus reviewed the facts at some length and noted the theories put forth by various observers, both American and Continental, let us see to what conclusions these facts, more or less illuminated by these theories, will certainly and unavoidably lead us.

First.—The identity of the streptococcus as the *contagium vivum* or microbial cause of erysipelas is a fact of such universal knowledge as to call for but formal mention. It is necessary, however, to call attention to a few of its characteristics. It is of slow growth and of variable morphology when its environment is changed. Its pathogenicity is also a matter of variability. It is probably but rarely air borne, needing direct personal contact in the vast majority of instances for its transference, so that Ohlmacher speaks of their "well advanced adaptation to parasitism."

Second.—We note the practically constant presence of the streptococcus and the pneumococcus in the normal nose and neighboring spaces, such as the throat and the mouth, and possibly the normal accessory cavities and the ear. The observations bearing on this fact I have taken care to give you in great detail.

Third.—We recognize the great variability in pathogenicity of both the streptococcus and the pneumococcus. Both, as we know, lie latent for months, for years, and even for an entire human lifetime, may bring forth absolutely countless millions of generations upon the hospitable pituitary mucous membranes of their host without betraying by a single overt act their presence. But this quiet and indolent existence may be broken in upon at any moment. Man has again and again produced this disturbance and roused these cocci to virulent fury under laboratory conditions, and nature has produced these same

storms in the human host of the streptococcus and the pneumococcus either (a) by temporarily and through some unknown cause inducing virulence in the microorganisms, or (b) through some unfavorable conditions which profoundly affect the patients and alter the constitution of the fluids and probably also the solids of the body, thereby supplying that environment which is necessary to induce the change which we call virulence, which consists essentially in a tremendous stimulation of the reproductive energies of the cocci with an attendant formation of toxins.

Fourth.—This process just referred to is not an unusual one in microbial pathology. We are familiar with practically the same phenomena in the life history of the typhoid bacillus and the bacillus tuberculosis.

Fifth.—The extreme frequency of erysipelas upon the face, as compared with its invasion of other parts of the body, has been noted for centuries. Only recently has the discovery that the cavities of the bones of the face—indeed, that the whole upper air tract—is the normal habitat of the microbial cause of erysipelas furnished us with a rational explanation of this predilection, and I have no doubt that, now that the attention of the general physician and surgeon is called to this matter by the rhinologist, we will find that many mysterious outbreaks of erysipelas or other streptococcus infection will be traced to some diseased nasal passage among the entourage of the patient. I have in mind the case of a distinguished Philadelphia obstetrician (communicated to me by one who was acquainted with the last generation of Philadelphia physicians) who in the latter years of his life left behind him a trail of puerperal sepsis which counted some 90 or 100 cases and which was attributed by his colleagues to the fact that he was afflicted with a chronic ozena.

Sixth.—I have cited to you a large number of spontaneous cases and surgical accidents occurring under the observation of a very small proportion of trained and educated men who make up our great American medical profession. These cases and accidents are just such as one would expect to occur in a certain proportion of patients under these known conditions. It must be a fact that modern aseptic and antiseptic methods has reduced the number of these infections where the virulence of the cocci has been mild, but the anatomical arrangement of the parts and the fact that virulent streptococci in rapid multi-

plication are only destroyed by very strong antiseptics of escharotic action makes it impossible to prevent the infection in every case. Think of a virulent streptococcus infection of the mastoid. It is a physical impossibility to prevent a possible infection of the freshly-wounded soft parts while the diseased bone is being slowly and carefully chiseled and curetted away. Or, again, think of the infected frontal sinus, tense with pus, with its exit closed by inflammatory swelling and colonies of streptococci penetrating the mucous membrane, invading the periosteum and eroding the upper layers of the bone. In some cases thorough exenteration of the sinus and the ethmoid cells cannot possibly reach and destroy every fold and crevice of the latter which harbor the multiplying streptococci, and a thorough operation necessarily involves most extensive wounds of the skin and subcutaneous tissue, the mucous membrane and submucous tissues, the periosteum and the bone. And yet the more violent the inflammatory process, the greater probability, theoretically, that we are in the presence of a virulent infection, the more imperative it is that we should immediately evacuate the pus cavity through a wound of our own making, that drainage may be rapid, direct and free, and the life of our patient be not imperilled by a streptococcic invasion of the cranial cavity, the meninges and the brain.

I submit that we have reached that point in our knowledge of this subject where we can say with positiveness that erysipelas is a streptococcus infection which is almost invariably an autoinfection from the upper air tract of the patient, and that in those rare cases where it is not an autoinfection the infection is derived from the air passages of some one in contact with the patient in some capacity. Modern knowledge of contagion and modern methods of cleanliness have practically entirely done away with the old epidemics of erysipelas that used to invade hospitals or communities some thirty or forty years ago.

In the prosecution of this study I have been struck by the comparative frequency of a serious involvement of the eyes and ears in the course of a facial erysipelas. That corneal ulcers or a keratomalacia should appear as a result of the violent inflammation of the lids and the tremendous pressure of the palpebral edema is not to be wondered at, but the fact of the matter is, that a variety of conditions supervene from apparently an identical cause, streptococcus infection, and the

resultant pathological state must be determined by the local conditions existing in each patient. Apparently, we never or rarely see some of these conditions in America. For instance, the French frequently, and the Germans occasionally, speak of a chronic thickening of the lids which occurs as the result of recurrent facial erysipelas, and resembles the condition of the skin in elephantiasis. Lavrand was, I believe, the first to describe this condition which he observed in a boy of 15. There was no condition of the eye itself which would afford an explanation of this strange phenomenon and Lavrand therefore connected it etiologically with a facial erysipelas which had recurred again and again and had always originated in the nasopharynx. The mucosa of the nose was swollen and Luschka's gland was enlarged. The treatment of this condition healed the affection of the lids. The correctness of this observation was subsequently confirmed by others. Parinaud, Uhthoff and Winckler have given us excellent descriptions of the various forms of streptococcus conjunctivitis and have connected these directly with disease of the lachrymal drainage apparatus, which as we know is itself a result of an inflammation of the nasal mucous membrane. Indeed, Winckler says, "The streptococci, as well as the staphylococci, which can produce acute inflammation of the mucosa of the upper respiratory tract, must be considered as etiologic factors in conjunctivitis."

Most authors who describe cases of atrophy of the optic nerve consecutive to attacks of facial erysipelas appear to consider that this is a compression atrophy due to orbital edema or abscess. This view, as you will observe from the cases cited, cannot always be borne out by the symptoms present or the results of physical examination. Hajek (86), the rhinologist, has pointed out that "The dissemination of the streptococcus in an erysipelalous eye is sufficient cause by itself. Their power to do harm is proportionate to the toxins they produce. Their growth in the lymphatics extends in all directions so that they travel in dense masses in the direction of the interstitial spaces and they also penetrate the tissues themselves in every direction. If the erysipelas involves the orbit they wander to Tenon's capsule, from here to Tenon's space and the optic disc, eventually then to the prolongations of the pia about the nerve and into the connective tissue which ensheathes the central vessels of the optic nerve. Even the

walls of the vessels are penetrated by the cocci and thus changes are produced in the vessels themselves."

In conclusion, I would submit for your consideration the following cases of ocular and aural complications due to and occurring in the course of erysipelas of the face, observing merely that they illustrate exhaustively the conditions that have been discussed in the paper.

Woman, aged 50. Five attacks empyema right frontal sinus, five months. Upper lids swollen and edematous, bony walls tender. Eye normal. Anterior extremity right middle turbinal bathed in pus. Middle turbinectomy. Two days later frontal sinus operation. On the following day pain. T. 100 F. On second day dressings were changed; some edema of upper lid and slight exophthalmos; wound clean; on raising lid patient exclaimed she could not see. Pupil fixed and semi-dilated. Ophthalmoscopically retina hazy and edematous; arteries small, inferior temporal artery obliterated; no swelling of disc. Three small hemorrhages about macula. Later atrophy and total blindness. The frontal sinus wound healed promptly. In the discussion which followed, Dr. Meierhof stated that he thought the condition was produced by a secondary orbital cellulitis.—Arnold H. Knapp, *Archives of Ophthalmology*, Vol. XXX, p. 308. (Compare this case with that of E. E. Foster, New Bedford, Mass., and case of J. H. Farlow, Boston, Mass.)

Girl of 18. Entered hospital for her second attack of erysipelas, the first having begun at the ala of the nose. Each attack occurred at a menstrual period. Severe attack. Several days after convalescence began, vision failed in one day and she was not able to count fingers. Ophthalmoscopic examination revealed atrophy of the optic nerves. Nothing abnormal with the yellow spot, the retina or the choroid.—These de Bordeaux, 1887, Colle.

Erysipelas following a wound of the lid. The right eye was closed for one month—when opened was completely blind. Paralysis lev. palp. sup. All the movements of the eye limited. Opacities of the lens. Disc pale. Vesse's reduced, many completely empty. Pigmented spots in region of macula.—*British Medical Journal*, 1878.

Erysipelas, orbital abscess. Protrusion and immobility of the globe, chemosis. Tumefaction of the lids which were not able to cover the globe. Ophthalmoscopically the fundus appeared whitish, studded with numerous hemorrhages, arteries invisible,

numerous veins dilated.—Knapp, *Revue d'ophthalmologie de Dor et Meyer*, 1885.

Woman, aged 68. Three months previously facial erysipelas followed by an orbital abscess. Rapid diminution of vision of right eye. Ophthalmoscopically, notwithstanding an immature cataract, one could determine an optic atrophy $V=0$.—Ramirez *N. Montpellier Med.*, 1897.

Woman. Severe attack of facial erysipelas. Abscesses, etc., of the lids. Exophthalmos. Mobility intact. Cornea clear. Anterior chamber normal. Posterior synechia. Lens and media clear. Ophthalmoscopically, left eye disc greyish white, slightly excavated, vessels reduced. Vision abolished.—Cabbannes, *These de Bordeaux par Fauveau*, 1903-1904, No. 94.

In a thesis at Basle, 1882. Anton Schwendt gives the following statistics: He studied 44 cases of phlegmon of the orbit, followed by diminution or loss of vision. Sixteen cases were due to erysipelas of the face, 4 of which had a fatal termination through thrombosis of the sinus or meningo-encephalitis. The author added to this group 4 cases not figuring in the statistics, where an erysipelas was followed by atrophy of the optic nerve and in which the inflammation of the cellular tissue of the orbit was not demonstrated, although probable. As a cause of abscess erysipelas entered into more than $1/3$ of the cases. These cases consecutive to erysipelas are very menacing to the vision. In Schwendt's collection of 18 attacked not one recovered. These phlegmons reveal a high mortality—30.7 per cent.—*These de Bordeaux*, Colle, 1886-1887, No. 106.

Chambermaid, aged 30. Attack of erysipelas of moderate severity, terminating on the eighth day. Edema of the lid, hyperemia of the conjunctivae—double iritis with posterior synechiae. Recovery. Vidal, *Gazette Med. de Paris*, No. 44, 1862.

Floating opacities formed in the vitreous humor, constituting a network interrupted here and there by membranes in shreds during the course of a facial erysipelas.—Mathias, *Recueil de medicine militaire*, 1869.

Among eight observations gathered by the author there were five monocular optic nerve atrophies and three that were binocular. In the five monocular cases the erysipelas had in two cases been consecutive to a wound of the same side which had not directly injured the eye. In four cases the erysipelas had been more pronounced on or else limited to the side on

which the optic atrophy had occurred. In three cases paresis of the lev. palp. sup., restriction of movement of globes, slight exophthalmos, but no decided evidence of orbital abscess. In all cases loss of vision appeared during the course of the erysipelas. The sound eye was not attacked following the atrophy of the nerve.—Parinaud, *Journal de médecine et de chirurgie pratique*, Oct., 1879.

In discussing cases of this character Panas said, "Numerous anastomoses of the ophthalmic vein are known. Recently Gurtwisch has again demonstrated by beautiful injections that numerous vessels unite the ophthalmic to the veins of the pterygo-maxillary fossa and in particular the spheno-palatine."—*Semaine medicale*, 1885.

Lapersonne said also that phlebitis of the ophthalmic vein and of the cavernous sinus was known to have been caused by lesions of the mouth, pharynx, lips and nasal fossae, such as septic wounds, furuncles, anthrax and especially erysipelas.—*Semaine medicale*, 1885.

Death on the nineteenth day of a facial erysipelas after delirium, grinding of the teeth, muscular contractions, pupillary irregularity. On the thirteenth day coma, dilated pupils, paralysis. On autopsy, thrombosis of the ophthalmic vein and the transverse sinus with cloudy effusion into the arachnoid. Weber quoted by Colle.—*These de Bordeaux*, 1886-1887, No. 106.

Ripault refers to a case exhibiting crops of chalazia after facial erysipelas and makes the following citations without giving the name or date of publications: Annular bands or paracentral plaques of the cornea, losses of substance bordering upon perforation of the lens (Gallsowski). Acute iritis monocular or binocular (Hanson, Vidal). Tardy iritis occurring in convalescence, analogous to that of typhoid or variola (Dor). Neuroretinitis with retinal hemorrhages (Sattler). Neuroretinitis due to numerous microbial embolisms (Nernheiser). Thrombosis of the central vein (Knapp). Detachment of the retina (Heineche). Des complications oculaires de l'erysipéle de la face (H. Ripault). *Gazette Medicale de Paris*, April 20th, 1895.

Case of facial erysipelas. "One week after the beginning of an attack, without previous pain or special local swelling and without any symptoms in the throat or nose, pus began to flow from the right ear. At this time the walls of the external auditory canal were normal and the pus obviously

came from the middle ear through an opening in the drum head."—J. A. Lippincott, *Medical News*, Philadelphia, 1890, LVII, p. 309.

Woman, aged 70. Erysipelas of the face having begun at the nasal orifice on the right half of nose and cheek. Throat red and tongue dry. Followed by optic neuritis and atrophy after edema of the lids, exophthalmos, ophthalmoplegia externa, chemosis, pupils dilated one-half and clear cornea.—F. Terrien. *Neurite et atrophie optique au cours de l'Erysipele*. *Progres Med. Paris*, 1904, XX, p. 165.

Man, aged 53. Facial erysipelas that began on mucous membrane of the lower lip. Intense earache. Pharyngitis. Rhinitis with tumefaction. Rupture of M. T. Mastoid red and tender. Paracentesis M. T. Recovery.—H. V. Würdemann, *Medical News*, Nov. 21st, 1891.

Unilateral orbital abscess, optic neuritis and blindness following facial erysipelas in which there was a continual purulent discharge from the corresponding nostril.—Carl, quoted by Fish, *American Journal of Surgery*, Sept., 1906.

Case of erysipelas, redness and swelling of the inner corner of the eye, much periorbital pain, considerable ptosis, limitation of movement, orbital fistula in upper and lower lid, no perception of light. "Several months before the attack he had for a considerable time a yellow discharge from the nostrils, sometimes offensive. This had quite ceased before the erysipelas and there seems, therefore, very little reason for supposing that the orbital inflammation was propagated from the nose." (!)—Nettleship quoted by Fish, *American Journal of Surgery*, Sept., 1906.

Man, aged 53. Incision of abscess of brow followed by erysipelas. Edema of the lids. Chemosis. On ninth day the cornea became lustreless, pupil hazy, anterior chamber reduced, tension plus. Delirium, coma and death on tenth day.—Warlomont, *Ann. d'Oculistique*, Paris, T. LXVI, Nov.-Dec., 1871.

Woman, aged 40. Abscess inner canthus right eye. Strabismus internus. Rapidly spreading excoriation lower one-third cornea, hypopyon and iritis. Anesthesia cheek and conjunctiva. Prolapsus and phthisis bulbi threatened. Patient recovered with lower two-thirds of cornea opaque.—Neve, *Brit. Med. Journal*, 1886, Vol. 1.

A serpiginous ulcer occurred on the lower third of the cornea. Microscopically it resembled a diphtheritic inocula-

tion.—Horner, *Klin. Monatsbl. f. Augenheilkunde*, 1875, s. 442.

Woman, aged 32. Erysipelas after the extraction of a tooth which had caused a swelling of the jaw. Skin of left upper lid deep violet, smooth, glistening. Enormous chemosis, palpebral and ocular conjunctiva. Closure of palpebral fissures impossible. Exophthalmos. Dislocation of globe outward. Orbital abscess, haziness of cornea, iritis, pupillary exudate, amaurosis, phthisis bulbi.—Fetzer in Arlt's *Bericht über die Augenlinik der Wiener Universität*, 1863 bis 1865, Wien 1867, s. 116.

Woman, aged 30. Erysipelas four years previously. Anchyloblepharon. Staphyloma corneae requiring enucleation. Examination showed previous ulceration and adhesion to tarsal connective tissue.—Kimeni, *Bullet. d'Oculist*, T. IX, p. 17.

Circumocular erysipelas after blepharoplasty on left eye. Corneal ulcer, perforation, general haziness and softening. Phthisis bulbi and cicatricial shrinking of the lid.—Warner, *Klin. Monatsbl. f. Augenheilk.*, 1872, s. 337.

Seventy-seven cases ocular involvement in the course of erysipelas; 16 cases—involvement of lids and orbit without affection optic nerve; 37 cases—involvement of lids and orbit with affection optic nerve; 13 cases—involvement of optic nerve without orbital disease; 7 cases—involvement of uveal tract.—Lewin & Guillery, *Die Wirkungen v. Arzneimitteln u. Giften auf das Auge*, Vol. 2, p. 31. Berlin, 1905.

Erysipelas with gangrene of the four lids.—Castresani *Spanish-Americ. Ophthal. Gesellsch.*, Apl., 1904.

Secondary involvement of the lachrymal organs. Cané, *Gazette de'Ophthalm.*, 1882. No. 5.

Thirty-five cases of orbital cellulitis with a mortality of 29 per cent. Of the cases which survived there were blind; bilaterally, 60 per cent, incomplete recovery of vision, 12 per cent, complete recovery of vision, 12 per cent. Knapp, *Archiv. f. Augenheilk.*, Bd. XIV, p. 257.

(a) Exophthalmos, necrosis of the lid, ulceration of the cornea, vision unaffected. (b). Edema and abscess of the lids. (c). Chronic rhinitis with erysipelas. Acute abscess of the upper lids. Necrosis of the skin of lids. Sloughing with exposure of orbicularis muscle. Streptococci in pus.—Mitvalsky, *Klin. Monatsbl. f. Augenheilk.*, 1893, s. 18. Aschenborn, *Archiv. f. Klin. Chirurgie*, XXV, s. 154.

Girl, aged 25 years. Edema of lids. Chemosis, subconjunctival hemorrhage. Ophthalmoplegia externa. Dislocation lachrymal gland. Exophthalmos.—Imre, *Klin. Monatsbl. Augenheilk.*, 1876, s. 187.

Man, 26 years. Edema of the lids, hyperemia of the conjunctiva, slight exophthalmos, chemosis inner canthus, ophthalmoplegia externa. Orbital abscess. Complete recovery.—Williams, *Boston Med. and Surg. Jour.*, Vol. CVIII, p. 51.

Boy of 6 years. Edema of the lids. Exophthalmos right eye. Ophthalmoplegia externa. Chemosis lower half ocular conjunctiva. Orbital abscess. Complete recovery after two and one-half months.—Williams, loc. cit.

Bilateral inflammation of the retrobulbar connective tissue. Brain was not involved and there was complete restitution of vision.—de Smet, *La Presse Medicale*, 1878, p. 137.

Girl of 15 years. Edema of lids, chemosis, exophthalmos. Congestion and tortuosity of veins of right fundus. Epidural abscess in temporal and middle cerebral fossa, necessitating chiseling away of zygomatic process of frontal and the frontal process of zygomaticus down to the ala magna of the sphenoid; also removal of temporal wall of orbit. Recovery without injury to eyeball or vision.—Nieman, Inaug. Dissertation, Griefswald, 1901, s. 7.

Small abscess right upper lid. Erysipelas. Exophthalmos gradually disappeared in the course of a year.—Lippincott, *Trans. Am. Ophthal. Soc.*, Boston, 1885, p. 702.

Cryptic erysipelas in a girl of 9 months who had previously been perfectly healthy. Convulsions, orbital abscess. Liberation of pus containing streptococci and staphylococci. Recovery.—*Bulletin et Mem. de la Société française d'ophtalmologie*, 1898, p. 57.

Man, aged 39. Erysipelas after fever and pain in bottom of right eye. Edema of lids. Tenth day, gangrene of lids. Exophthalmos right eye. Ophthalmoplegia externa. Cornea hazy, dry, non-sensitive. Pupil irresponsive. Yellowish cloudy mass in fundus. T. +. Rupture of globe emitting offensive pus. Removal of lids. Enucleation of globe. Necrosis and sloughing of orbital tissue.—Biermann, *Klin. Monatsbl. f. Augenheilk.*, 1869, s. 91.

Primipara, 33 years. Nasopharyngeal catarrh. Erysipelas two days after delivery. Edema of lids. Gangrene skin of right lid from the lashes to the brows. Streptococci in the

necrotic masses. Bulbar conjunctiva ulcerated. Small abscesses in lower part of cornea. Exophthalmos, amaurosis, orbital abscess. Iris discolored, pupil small and adherent to lens. Hypopyon, corneal perforation, prolapse of iris. Exenteration of globe. Ectropion both lids.—Joss. *Correspondenzbl. f. Schweitzer Aerzte*, Bd. XXXI, 1901, s. 617.

Erysipelas after shelling out an orbital cyst. Panophthalmitis.—Kraotschenko, *Abhandl. der Gesellsch. russ. Aerzte zu Petersburg*. Jahrg. LIV, s. 125.

A man of 38 had had a phlegmonous facial erysipelas while a child. As a result of this the entire face, including the nose, ears and eyelids, had been converted into a smooth cicatrix. The nose and the mouth were each designated by an opening. In the mouth could be seen the atrophic tongue grown fast to the alveolus and one remaining tooth. The eyelids could be felt through the skin.—Santos Fernandes. *Ophthalmol. Klinik*, 1900, No. 14.

Woman, aged 60. Involvement of right lachrymal sac. Edema of lids with formation of blebs. Coma, delirium and death on fifth day. Autopsy revealed abscesses about nasal duct in the right lid and in the orbit.—Piorry, *Clinique Medicale*, 1833, p. 381.

Man, aged 42. Pustules of lids. Orbital abscess. Death on the thirteenth day. Autopsy. Bilateral orbital abscess. Both globes atrophic. Pus in Tenon's capsule. Vein of fissure of Sylvius tense with yellow contents. Yellow fluid in subarachnoid spaces. Cerebral necrosis. Nucleus of right lens contained an area filled with micrococci.—Schüle, *Archiv. f. pathol. Anatomie*, Bd. LXVII, s. 125.

Boy of 5 years. Contusion of left eyelid. Erysipelas. Third day exophthalmos both globes. Fifth day orbital abscess (left) opened spontaneously. Ulceration right cornea, perforation. Death eleventh day. Autopsy. Pus in cavernous sinus and middle cerebral fossa. Abscess right orbit and diffuse purulent infiltration of orbital fat. Small abscess in left orbit.

Man of 43. Exophthalmos left globe. Ophthalmoplegia externa. Chemosis. Later, chemosis right eye. Left frontal vein could be felt as hardened cord. Delirium, stupor, facial paralysis, death in six days. Autopsy. Dura at base of middle cerebral fossa covered by punctate extravasations and an exudate. The optic nerves in their foramina were surrounded by pus. Pia at the base infiltrated with pus. Islands of pus in

the orbit, in the ocular muscles and along the veins.—Bayle, *Prager med. Wochenschr.*, 1881, s. 221.

Girl of 15 years. Abscess of lip. Incision. Erysipelas. Exophthalmos. Right pupil fixed. Death in six days. Autopsy. Purulent phlebitis left anterior facial vein which extended into the left superior sinus petrosus. Orbital tissues were edematous.—Cohn, *Klin. der embol. Gefässkrank.*, 1860, s. 196.

Out of 221 cases of optic atrophy, 14 were due to erysipelas.—Uthoff, *Klin. Monatsbl. f. Augenheilk.*, 1900, s. 533.

Of 51 cases of erysipelas in which the vision became affected there were changes in the fundus of the eye in 37. The fundal changes were unilateral in 25 cases and bilateral in 12 cases. Convalescence with complete or partial restoration of sight occurred 8 times or in 16 per cent of the cases.—Lewin & Guillery, *Die Wirkungen von Arzneimitteln und Giften auf das Auge*, Vol. 2, p. 31. Berlin, 1905.

Girl, aged 12 years. Left globe, ophthalmoplegia externa, exophthalmos, connective tissue red and edematous. High grade of amblyopia. Meningeal symptoms and death on the eighth day.—du Gourlay, *Annales d'Oculistique*, T. CXXX, p. 199.

Man, aged 28. Infiltration of the lids. Exophthalmos left eye. Orbital abscess, ophthalmoplegia externa, amaurosis, perforating ulcer of cornea, phthisis bulbi. After several weeks, death due to bronchitis and debility.—Noyes, *Richmond and Louisville Medical Jour.*, July, 1875, p. 856.

Girl, aged 20. Bilateral abscess of orbit. No suppuration in either eye, but there was a total and complete amblyopia with dilated pupils.—Demarquay, *Traité des tumeurs de l'orbite*, 1860, p. 134.

Man, aged 60. Abscesses of the left lids. Improvement after incision. About two weeks later increasing chemosis, exophthalmos, diminished rotation and amaurosis. Greyish yellow discoloration of the fundus and slight contraction of retinal vessels. Orbital abscess. Amblyopia permanent. Optic atrophy.—Williams, *Boston Med. and Surg. Jour.*, Vol. CVIII, p. 51.

Man, aged 64. Abscess right lids. Chemosis. When eye could be opened was found amaurotic. Exophthalmos, but no discoverable orbital abscess. Atrophic changes in disc. Vessels contracted. Amaurosis permanent.—Williams, *loc. cit.*

Man, aged 41. Erysipelas after a fall. Right eye closed for four weeks. When finally opened totally blind. Cornea clear, pupil dilated and immobile, media hazy, disc pale bluish, atrophic appearance. Arteries contracted, some empty and some contained blood only in spots. Accumulations of pigment in region of macula.—Benson, *Brit. Med. Jour.*, 1878, Vol. 1, p. 371.

Man, aged 64. Gangrene of lids. Corneal epithelium necrotic. Exophthalmos, ophthalmoplegia externa. Retinal vessels in both eyes empty, with one exception. Disc of a grayish white discoloration. Coggin, *Am. Oph. Soc.*, 1879, 11, p. 570.

Gangrene of both lids of each eye. Orbital involvement. Optic atrophy.—Globe not affected.—Arlt, quoted by Lewin and Guillery, loc. cit.

Serious involvement of the meninges.—Biermann, *Klin. Monatsbl. f. Augenheilk.*, 1869, p. 91.

Man of 48. Lost perception of light four weeks after onset of erysipelas. Disc pale, arteries reduced. Pupils react to accommodation and convergence, but not to light. Ptosis and ophthalmoplegia externa. Orbicularis palpebrarum paralyzed. Orbital abscess.—Nettleship, *Trans. Ophth. Soc. United Kingdom*, 182, Vol. II.

Man of 23. Optic atrophy produced by compression by the edematous orbital tissues.—Despaquet, *Recueil d'Ophthalmol.*, 1880, p. 176.

Man of 51. On the third day of erysipelas, exophthalmos, amaurosis, ophthalmoplegia externa. Edema of the lids, ulcer of the cornea; later, macula. Optic disc white and completely atrophic.—Schiess, bei Schwendt, *Ueber Orbita-phlegmone*, Basle, 1882.

Man of 63. Edema of the left lids, closing palpebral fissure. Diminished rotation and tenderness of globe. When lids could be opened, complete amaurosis. Sharply defined white disc. Paralysis levator superior. Palp.—Pagenstecher, *Klin. Monatsbl. f. Augenheilk.*, 1870, s. 270.

Man of 49. Erysipelas. Eyes closed two weeks. Two months later V=15/100 R. and L. Discs reddish white, sharply defined. Vessels, especially arteries, diminished in lumen. F. V. contracted and “a sharply defined dimness of vision about the point of fixation.”—Pagenstecher, loc. cit.

A soldier had had three attacks of erysipelas. Six months after the last attack the upper lids were swollen and drooping. Slight external strabismus and dilatation of the pupils. V=1/5.

Central scotoma. The centre of the disc showed beginning atrophy, the periphery was edematous. There were several atrophic patches in the choroid. An inflammation of the sheaths of the optic nerves was accepted as a cause.—Dufaut, *L'Union Medicale*, 1886, No. 171, p. 1002.

Erysipelas with exophthalmos and chemosis and great edema of the lids for four weeks. After opening the right eye it was totally blind. Changes in the blood vessels and haziness of the retina.—Schmaller, *Archiv. f. Ophthalmol.*, Vol. VII, Part 1.

An elderly man, with great edema of the lids for several days. When it was possible to open them the right eye was blind. Disc pale, and white on macular side; arteries reduced.—Hutchinson, *Ophthalm. Hosp. Rep.*, V. 7, 1871.

Pregnant woman of 43. Six weeks after onset of erysipelas right circumocular tissues still infiltrated, movements normal, pupils dilated and fixed, cornea clear, disc white. Left globe ophthalmoplegia externa, abscess of cornea, prolapse of iris; later phthisis bulbi. Death.—Schiess, bei Schmidt, l. c. 321.

Woman of 27. Edema of lids, exophthalmos, chemosis, orbital abscess. Pupils small. Both eyes amaurotic, discs pale, vessels contracted. On the eighth day, fingers could be counted. Fourteenth day corneal ulcer on right eye followed by perforation. L. V.=6/9—Bayer, l. c., p. 222.

Girl of 10. Edema of the lids on right, exophthalmos, ophthalmoplegia externa, chemosis. V=fingers, 15 feet. Corneal ulcer. Orbital abscess. Amaurosis. Perforation of cornea, with escape of lens and vitreous. Phthisis bulbi.—Leber, *Archiv. f. Ophthalm.*, Bd. XXVI, Part 3.

Both eyes affected. One with optic atrophy and a white disc, which showed an edematous margin, and the other a neuroretinitis, which shortly thereafter underwent atrophy.—Lubinsky, *Klin. Monatsbl. f. Augenheilk.*, 1878, s. 168. Nettleship, l. c.

Papillitis with pronounced exophthalmos downward. Recovery.—Karafiath. Szemeszet, 1884, I, p. 64.

Chorio-retinitis and maceration of the pigment in the region of the macula lutea. Atrophy of the pigment epithelium about the vessels. A wide band-like zone of atrophic pigmented epithelium between the macula and the disc—Hoesch, *Ueber Erkrankungen*, etc., Berlin, 1881. Herodes, *Inaug. Disser.*, Würzburg, 1888. Carl, *Klin. Monatsbl. f. Augenheilk.*, 1884, s. 113.

Man of 54. Eyes closed several weeks from edema of the lids. When opened again, patient was blind. Exophthalmos. Right disc white. Vessels indistinct, lumen normal. Left, acute neuro-retinitis. Atrophy, white streaks about vessels. Later vessels obliterated in spots.—Lubinsky, *Klin. Monatsbl. f. Augenheilk.*, 1878, s. 168.

Post-erysipelas, two cases optic atrophy. In a third, orbital abscess, exophthalmos L. V.=O. Pupil dilated ad max. Aqueous hazy. Optic atrophy—R. T. + 4. Choked disc.—Halkermann, *Verlin d. Aerzte des Regier.* Augsberg, 32. *Versammlung*, 1894.

Girl of 16. On the fourteenth day of erysipelas, exophthalmos, ophthalmoplegia externa, dilatation pupils, media clear. Amaurosis. Retina white, vessels slender, discs only identified by vessels. Orbital abscess. Slight improvement in ocular symptoms before death.—Ginguel, *Recueil d'Ophthal.*, 1879, p. 65.

Man of 40 with lues. On the fifth day of erysipelas, exophthalmos and chemosis, bilateral. Myosis. Amaurosis. Corneal ulcer, right, due to exposure. Ninth day, fundus, left, milky white. Vessels almost reddish black and three times normal size. Extravasations. Same in right eye. The condition of vessels and fundus improved, but amaurosis complete.—Knapp, *Archiv. f. Augenheilk.*, B. XIV, s. 257.

Man of 36. Edema of the lids. Orbital abscess. Amaurosis right. Exophthalmos. Impaired rotation. Disc hazy, vessels partially converted into white strands. Exophthalmos and chemosis persisted for months. In two years the vessels had disappeared all but a few white streaks and two trunks filled with blood. Carl, *Klin. Monatsbl. f. Augenheilk.*, 1884, p. 113.

Pregnant woman of 41. Edema of lids, exophthalmos, ophthalmoplegia externa, chemosis. Orbital abscess. Pupil did not react. Amaurosis. Disc hazy, irregular in shape and white. Arteries thread-like, veins distended. Later, vessels disappeared almost entirely.—Hoesch, *Ueber Erkrankungen der Gefässwandungen in der Retina.* Berlin, 1881.

Man of 48. Edema of lids, exophthalmos, ophthalmoplegia externa. After opening the lids amblyopia, and objects seen in blue fog. Discs marble-like whiteness, vessels reduced. Pigment epithelium atrophic along the vessels. Necrotic areas of pigment epithelium between macula and disc.—Herodes, *Zur Casuistik der Fälle von Sehnerven Atrophie nach Erysipel.*, Würzburg, 1888.

Woman. Double exophthalmos, right amaurosis, disc and retina atrophic. Vessels reduced.—Jäger *Ophthalmoskop. Handatlas*, 1869.

Woman of 28. Edema of the lids, exophthalmos. Anesthesia inner half right eyebrow. Fifth day amaurosis right eye. After five months, disc white, not sharply defined. Vessels contracted and bordered by yellow stripe, empty of blood in places.—Jäger l. c. Fig. 75, Plate XVI.

Woman. Edema of lids, bilateral R. conjunctiva chemosed. Right upper lid fluctuating. Orbital abscess. Amaurosis. Embolism art. cent. ret. Vessels thread-like; disc pale, whitish haze. Cherry-red spots about macula. Four weeks later, total optic atrophy.—Emrys-Jones, *Brit. Med. Jour.*, 1884, Vol. I, p. 312.

Following erysipelas a unilateral and a bilateral blindness has been noticed. In the latter case, in the left disc were found beginning atrophic changes ten weeks after the onset. The arteries were narrowed and there were retinal hemorrhages, and later hemorrhages into the vitreous. It was assumed that the orbit had been slightly inflamed.—Snell, *Ophthalm. Review*, 1893, p. 157. Terrien et Sesne, *Archiv. gener. de Médecine*, 1903, p. 2699.

Erysipelatous inflammation of the orbit where, after extinction of sight, complete restoration occurred.—v. Graefe, cited by Lewin & Guillery, *Die Wirkungen von Arzneimitteln und Giften auf das Auge*, Vol. 2, p. 31. Berlin, 1905.

Man of 25. Erysipelas. Pain in left eye. Edema of lids, exophthalmos, chemosis, amaurosis. Same condition followed in right eye. Left fundus not visible. Right, narrowed arteries and unequal venous distribution. Coma.—T. 40 degrees C. Death. P. M. Diffuse purulent infiltration of orbits. Abscesses in ocular muscles and veins. Sinus thrombosis, purulent meningitis, purulent pulmonary infarcts. The infection of the right orbit seems to have come through the sinus cavernosus.—Leber, *Archiv. f. Ophthalmol.*, Vol. XXVI, Part 3, p. 224.

Man of 21. Erysipelas followed by extreme exophthalmos, orbital abscess, dilated pupils, amblyopia. Ulcer of the cornea, chemosis, restricted rotation. Disc white, arteries almost absent, veins tortuous. Twenty-five days later, left otitis media suppurativa acuta. Epileptiform attacks. Temporal abscess. Death in six months, with cerebral disturbances. Autopsy. Left middle convolution was a mass of pus. Tubercular areas.

Purulent basilar meningitis, ostitis, orbital phlegmon. Optic nerve was completely replaced by developing connective tissue. The vessels were open.—Panas, *Gazette des hopitaux*, 1873, p. 1148.

Woman. Fourth day after the subsidence of an erysipelas, terrific pains in right orbit. Conjunctivitis. In forty-eight hours edema of the lids, exophthalmos, amaurosis, cornea hazy, ophthalmoplegia externa, pupil fixed. Left eye same condition but less marked. Cerebral symptoms and death on sixth day. Autopsy. Both orbits infiltrated with sero-purulent fluid. Both ophthalmic veins filled with pus. Pus in sinus cavernosus and right middle cerebral vein.—Poland, *Ophthal. Hosp. Reports*, Vol. I, 1857, p. 26.

Woman of 60. Comatose 14 days. Edema of lids. No exophthalmos, but pain in the eyes. Eyes not seen for 4 weeks. Then left eye amaurotic. Right eye normal. Symblepharon left lower lid. Left pupil one-half dilated. Disc flattened, greyish white discoloration. Arteries reduced, some obliterated.—Schenke, *Prag. med. Wochensch.*, B. III, No. 23, s. 229.

Woman of 59. Rapid diminution of vision, bilateral, after erysipelas one year previously. Fingers at 20 c. m. Discs atrophic, greyish white, slightly excavated. Vessels normal. Choroid atrophic near disc margin.—Parinaud, *Archives de med.*, 1879, 7 ser., T. 3, p. 644.

Man of 54. Enormous edema of lids. Orbital abscess. Total bilateral amaurosis. Death in four months. Autopsy; lids, orbit and globe normal. No bacteria. Both optic nerves oval at optic foramina and spongy. Nasal portion, yellowish grey; temporal, greyish white. Pronounced increase of connective tissue in temporal portion; nasal part retained its neuroglia. Central vessels normal.—Lewin and Guillery, l. c.

Woman of 26. Erysipelas lasting ten days. Then severe headache, fever and failure of vision to absolute amaurosis on eighteenth day. After forty-eight hours improvement of vision, but visual hallucinations. Floor gave reflection like a mirror and from an excavation in it flames burst forth. In six weeks counted fingers at 1 m. Concentric contraction F. V. bilateral. Central scotoma, left. Discs atrophic. Vessels normal. V. improved to 1/5.—Parinaud, *Arch. generale de med.* 1879, 7 ser. T. 3, Juin, p. 641.

Woman of 26. Recovery from erysipelas. Then deafness and amblyopia. Fourteen days later dilated pupils. Seventeen days amaurosis, right. V. was completely restored in four weeks.—Duriozicz bei Gubler, *Arch. gen. de med.*, 5 ser., T. XV, 1860, s. 698.

Woman of 30. Following erysipelas, headache, deafness of the right ear, dense haze in right eye, cloudiness left eye, choreiform disturbances arms and legs, red flashes right eye. In eight weeks the eyes had very much improved. The other disturbances continued.—Duriozicz bei Gubler, l. c. p. 703.

Woman of 32. Third attack of erysipelas. As sequelae great asthenia and anemia. Choreic twitching of head and progressive amblyopia to complete amaurosis. Pupils dilated and fixed. In a year the visual disturbances had disappeared.—Bourdon bei Gubler, l. c. s. 699.

Man of 40. Severe exposure during an attack of erysipelas. Twenty-four hours later amblyopia. $V=1/7$ Jäg. No. 17. Slight concentric contraction F. V.: Central scotoma. Venous hyperemia of fundus. Recovery in five or six months.—Thier, *Klin. Monatsbl. f. Augenh.*, 1900, s. 643.

Girl of 16. Edema right upper lid. Fourth day complete amaurosis. Pupil dilated but reacted. Disc hazy margin. Vessels narrowed. Fifteenth day ophthalmoscopic examination negative. V =motion of hand. Three days later changes in F. V. V =fingers at 12 ft. Rapid improvement. Twenty-fifth day complete recovery.—Weiland, *Deutsche med. Wochenschr.*, 1886, No. 39.

Man of 32. History excessive alcoholism. Erysipelas with coma for nine days. After recovery, severe headache, failing vision. L. V.=fingers $\frac{1}{2}$ metre. F. V. normal. Nyctalopia. Left disc injected, hazy. Haze over retina with distended veins and reduced arteries. Tenderness on pressure or movement of globe. Later neuro-retinitis in right eye. In fortnight slight improvement; in five weeks complete recovery right and left.—Vossius, *Klin. Monatsbl. f. Augenheilk.*, 1883, s. 294.

Man of 19. Recurrent erysipelas of right side. A few months later vision failed. $V=2/10$. After another attack R. V.=20/200, L. V.=1. Haziness of vitreous, retinal detachment, macular hemorrhage, yellow plaques. Picture that of nephritic retinitis. Later marked improvement. V =almost $2/3$. In two days relapse. Fundal picture much as before. V =fingers at 14 ft. F. V. reduced. Again, improvement. In six months

another relapse of erysipelas with failure of vision. Atrophic changes in fundus. Excentric scotoma. V=20/50. Later V=20/30.—Vossius, *Klin. Monatsbl. f. Augenheilk.*, 1880, s. 410.

On account of a purulent cyclitis with unendurable pain, enucleation had to be done in one case. A hyaloiditis duplex which had been caused by erysipelas required a paracentesis and a culture of *S. erysipelatis* was obtained from the aqueous humor. (Compare Hoesch, Vossius, Fetzner, Hallerman, l. c., and Hausen (Nord. Ophth. Tijdschr., T. IV, p. 29) who observed a case of severe erysipelatous plastic iritis with considerable exudate on the anterior lens capsule which terminated favorably.)—Fortunati, *Reforma medica*, Ottobre, 1889.

Wagenmann found streptococci in the arterioles of a patient suffering from albuminuric retinitis who had died from erysipelas.—*Sitzungsberichte der Ophth. Gesellsch.* Heidelberg, 1896. Discussion zu Axenfeld.

Man of 26. During convalescence from erysipelas there appeared headache, fever, contracted and fixed pupils, coma with dilated pupils, left hemiparesis and death in 22 days. A seropurulent secretion was found in the lateral ventricles and a meningitis of the frontal lobe of the right hemisphere, thrombosis of the sinus cavernosus and of the right ophthalmic vein. Lewin and Guillery, l. c.

Streptococci were found in an eye which suddenly developed panophthalmitis without assignable cause; the culture of the *S.* resembled pneumococci closely. The vitreous was infiltrated with pus, the arteries thickened. The retina was destroyed. In front of it were masses of cocci and zooglea. The patient had frequently suffered from recurrent erysipelas.—Axenfeld, l. c.

Woman of 46. Repeated attacks of erysipelas. Developed visual disturbances after last attack. R. V.=fingers at 30 cm., L. V.=fingers 1 m. Hyaloiditis duplex. Floating opacities. Fundus invisible. Paracentesis gave cultures of streptococci in 48 hours.—Gillete de Gramont, *Bull. et mem. de la Soc. française de Ophthalm.*, T. X., 1892, p. 285.

A septic embolus of the right eye developed due to erysipelas. There were swelling of the lids, circumcorneal injection, tenderness of the ciliary region, hypopyon, haziness of the vitreous T.+2. Vision lost. Death on twenty-fourth day. Orbital involvement could not be demonstrated.—Cornwell, *Medical Record*, 1882, August 12th.

A patient of 45 who had had prodromal symptoms of glaucoma for a long time developed erysipelas after leeches and atropin had been used. An acute glaucoma developed in both eyes after a few days. Outcome bad despite the fact that iridectomy had been made. Another case developed facial erysipelas six days after an iridectomy for glaucoma. This operation was also unsuccessful.—Galezowski, *Recueil d'Ophthal.*, 1876, p. 202. Other cases are reported with a more favorable outcome.—Magauky, *Peterb. medic. Wochenschr.*, 1890, s. 301.

Man of 20. After erysipelas, sudden paralysis of the nerves of the superior branch of trigeminus. Slight exophthalmos. Recovery after inunction, although no evidence of lues.. After several weeks a sudden transient, complete paralysis of left oculomotor. Chronic meningitis with orbital phlegmon and hemorrhage in the vicinity of the superior orbital fissure were given as causes.—Stoener, *Münch. med. Wochenschr.*, 1892, s. 863.

Girl of 18. During and after an attack of erysipelas, unilateral paresis of accommodation.—Schmidt-Rimpler, l. c.

Personal Communications of Damage to the Eye and Ear from Members of the American Laryngological Society, American Otological Society, American Academy of Ophthalmology and Oto-Laryngology, and American Ophthalmological Society.

David Coggin, Salem.—One case of loss of vision of both eyes after erysipelas.

D. W. Greene, Dayton.—Case of erysipelas following tenotomy of internal rectus of right eye. Loss of vision from atrophy of optic nerve.

F. P. Capron, Providence.—“A very few cases of ocular trouble due to erysipelas, but no record of the causes of the erysipelas.”

Wm. L. Wood, Portland, Ore.—One case of facial erysipelas in which the cornea of each eye was destroyed. The origin of the erysipelas was not traced to diseased nasal chambers.

Walter R. Parker, Detroit.—Two cases of glaucoma in the course of facial erysipelas. Both recovered without operation, although had there been no erysipelas, Parker would have advised immediate iridectomy in both cases.

Herbert Harlan, Baltimore.—One case inflammation of the eye of a young woman. Facial erysipelas following severe

conjunctivitis (probably streptococcus infection). Another similar case. Physician, aged 67. Conjunctivitis of unknown cause. Rather severe erysipelas on right side with great edema of lids of both eyes. Now under treatment and rapidly subsiding. No permanent damage to eye in either case.

R. S. Lamb, Washington.—Has seen a number of cases in which more or less extensive damage was done to the eye as the result of an attack of facial erysipelas, but as they were clinic and dispensary cases, he has no records.

J. C. Easton, Springfield, O.—Facial erysipelas. Edema of lids, sloughing tissues near inner canthus. Orbital abscess. Conjunctivitis. Ulcus corneae. Recovery with slight haziness of cornea and slight retraction of upper lid.

John E. Weeks, New York.—One case of blindness in both eyes due to erysipelas extending from face to orbits. Reduction of size of retinal arteries. Thrombosis of veins. Subsequent optic nerve atrophy. Patient, male 32 years. Erysipelas apparently extended from nasal mucous membrane. One case blindness in one eye following facial erysipelas of unknown origin. Patient, female, 24 years of age. Erysipelas most severe on right side of face. Right eye blind. Arteries small, veins thrombosed. Nerve eventually atrophied.

W. H. Peters, LaFayette.—“In the cases I have seen there has been chronic hypertrophic rhinitis. The patients have consulted me for tear sac trouble.”

Jas. W. Ingalls, Brooklyn.—*Case I.*—Erysipelas affected both sides of face—blindness of both eyes resulted. Soon died of pneumonia. *Case II.*—Facial erysipelas caused blindness of one eye. There was no sinus trouble. *Case III.*—Sloughing (partial) of both upper lids. Sight not affected to any extent. No disease of accessory cavities as far as known.

L. R. Ryan, Galesburg.—“Woman of 70 years operated upon for senile cataract. Erysipelas developed within 24 hours, involving nose, cheeks and forehead. Cornea sloughed and eye was lost. I afterward discovered pus deep in duct, also some involvement of the ethmoid. Case was undoubtedly of nasal origin.”

H. M. Fish, *Case I.*—“A lady patient, whose vision I knew to be normal, complained of a reduction of vision and redness and swelling of the upper lid, noted the day before; there had been some pain and trouble about the eye for several days. Marked violet-colored swelling of the upper lid and internal

angle of the orbit; pain on pressure under the frontal sinus. Media clear; disc edematous, its margins obscured. V.= 10/20. In the middle meatus a mucopurulent secretion. Syringing the frontal sinus brought about complete restoration and normal vision in a few days' time." *Case II.*—"A patient recently consulted me for unilateral amaurosis, a complete optic atrophy, that followed an attack of facial erysipelas several years ago. * * Nasal examination showed a chronic "atrophic rhinitis"—the misnomer for an accessory sinus disease in only too many cases. In this case an accessory sinus disease was probably the primary lesion, the facial erysipelas and optic atrophy secondary thereto. In my opinion the veritable pathogenesis in the great majority of non-traumatic erysipelas-ocular cases is a strepto- or staphylococcic infection of a nasal accessory sinus or the upper nares with propagation to the orbit, cranium or subcutaneous tissue."

Joseph C. Beck, Chicago.—Case of facial erysipelas starting at ala nasi. Involvement of eye. Conjunctivitis, keratitis, ulcer cornea. Termination, leucoma cornea.

Edward Jackson, Denver.—"I have seen glaucoma and optic atrophy from facial erysipelas, besides orbital cellulitis and inflammation of the lids. But I have not traced the erysipelas to disease of the nose or its accessory sinuses."

Joseph A. Andrews, Santa Barbara.—Case of erysipelas developing after abrasion and possible fracture of nose. Edema of lids, orbital cellulitis, exophthalmos. Death in two or three days from meningitis.

Allen Greenwood, Boston.—"Recent case of facial erysipelas developed severe phlegmon of the orbits with proptosis and destruction of both eyes and upper lids. Death. Origin of erysipelas not determined."

Frank R. Spencer, Boulder.—Case of facial erysipelas. Man aged 70, with carcinoma of liver and interstitial nephritis. Erysipelas extended to the cellular tissue of right orbit. Proptosis and convergence, chemosis, lids edematous, cornea and media hazy, hypopyon. Fluctuation upper external angle orbit. Incision liberated 8 cc. pus. Panophthalmitis. Coma and death one week later.

H. Bert Ellis, Los Angeles.—Sailor, aged 54 years. Dacryocystitis. Erysipelas. Severe case. Panophthalmitis. Subsequent enucleation. Man aged 57. Carpenter with only one eye. Developed erysipelas after slight injury of cheek. Orbit

of only eye involved. Lids board-like on second day. External canthotomy and opened several abscesses in lids. Gave 80 cc. streptolytic serum. Patient unable to move eyeball, saw flashes of light and was delirious. Recovery complete in eight days. Patient a sufferer from chronic atrophic rhinitis.

L. L. Doane, Butler, Pa.—*Case I.*—Man, aged 24. Seen in consultation on eighteenth day of facial erysipelas. Latter began at nose. Face enormously swollen. Many abscesses scalp and lids. Pus in left orbit. Evacuated. Recovery. V= $1\frac{1}{2}$, right, fingers at six feet, left, without correction. Right normal with correction, left only improved a little. *Case II.*—Young married woman. Phlegmonous erysipelas of orbit and face. Incised orbit, no pus. Recovery. V=better than $1\frac{1}{5}$ in affected eye and still improving.

H. M. Ray, Louisville, Ky.—Man, aged 60. Slight wound of eyebrow. Facial erysipelas, orbital cellulitis, optic neuritis and neuro-retinitis terminating in atrophy of optic nerve and complete loss of vision. One case optic nerve atrophy which was said to have followed injury and facial erysipelas, as in above case.

M. H. Post, St. Louis.—One or two cases years ago where atrophy of the optic nerve followed facial erysipelas.

Jas. F. McKernon, New York.—Female, aged 17 years. Destruction of portions of both eyelids. Sight improved somewhat later on. Supposed erysipelatos infection from old supuration of middle ear.

Edw. A. Shumway, Philadelphia.—Several cases of orbital cellulitis during attacks of facial erysipelas.

Robert Sattler, Cincinnati.—Two cases of unilateral optic nerve atrophy result of facial erysipelas, but could not trace cause to intranasal disease.

J. A. Stuckey, Lexington, Ky.—In two cases of erysipelas following: (1) frontal, and (2) ethmoidal disease, the eye was seriously threatened, but no permanent injury resulted.

Oscar Dodd, Chicago.—Wound of lid. Erysipelas orbital abscess. Blindness from optic nerve atrophy.

E. S. Strout, Minneapolis.—Facial erysipelas. Abscess of upper eyelid resulting in considerable deformity, which gradually disappeared.

Eugene Smith, Detroit.—Sloughing of skin of upper lid and panophthalmitis.

M. V. Hall, Warren, Pa.—Great edema of orbital tissues,

Vision nil. Death from pyemia and thrombosis of cavernous sinus.

C. A. Veazey, Philadelphia.—Two cases of optic nerve atrophy.

P. M. Farrington, Memphis.—(1) Exophthalmos and ophthalmoplegia externa. Death. (2) Exophthalmos and ophthalmoplegia externa. Thrombosis of the transverse sinus. Death.

Thos. F. Kellar, Toledo.—Exophthalmos and ecchymosis conjunctivae with each recurrent attack. Empyema antrum of Highmore.

F. C. Hotz, Chicago.—One case optic nerve atrophy following erysipelas.

E. C. Ellett, Memphis.—One fatal case of erysipelas in which the eyelids sloughed. One case in which skin of left upper lid sloughed, but not enough to cause deformity. Latter case had left frontal sinus and antral suppuration two years after the attack of erysipelas noted.

Wm. Merle Carhart, New York.—Erysipelatous infection extended to right eye, causing orbital cellulitis. Phlegmon was opened, but corneal ulcers and panophthalmitis followed. Infection extended to cranial cavity. Death from meningitis. Erysipelas followed nasal disease.

Jas. A. Spalding, Portland, Me.—Two cases seen in consultation. Men over 50 years, both blind with optic atrophy in each eye. Alleged cause was erysipelas of eyelids and forehead. No apparent cause except extremely cold weather. Both men were hostlers. Erysipelas may have been due to rubbing foreheads and eyelids with unclean hands after attending to horses.

Chas. Adams, Trenton.—Woman, aged 47. Sloughing of cornea, prolapse of iris. Severe and constant pain in phthisical bulb. Enucleation. T. S., aged 50. Insane asylum. Erysipelas involving cornea of right eye. Death in a few days from meningitis.

E. A. Kegley, Cedar Rapids.—Corneal ulcers due to an attack of facial erysipelas. Chronic dacryocystitis.

L. Haynes Buxton, Oklahoma City.—Robust girl of 18 years, with history of perfect health. Facial erysipelas complicated by secondary mastoiditis. Death from meningitis.

F. L. Henderson, St. Louis.—Furuncle at end of nose. Facial erysipelas, orbital cellulitis. Thrombosis cavernous and

lateral sinuses. Death. No disease of nose or accessory sinuses.

Wm. R. Dabney, Marietta, O.—(1) Thrombosis of central vein of retina in both eyes. Death from extension to the meninges. Chronic bilateral pansinusitis. (2) Complete atrophy of both optic nerves. Chronic bilateral antral suppuration.

W. F. Mittendorf, New York.—One case orbital abscess. Two cases sloughing of lower lids.

C. Barck, St. Louis.—Three cases atrophy optic nerve, ending in blindness.

D. E. Esterly, Topeka,—(1) First attack of erysipelas followed by ectropion lower lid. Second attack by perforating ulcer cornea. Iridocyclitis, etc. Enucleation. (2) Cicatricial ectropion left lower lid following erysipelas. Septal perforation. Hypertrophied lower turbinate. Hypertrophied middle turbinate with polypoid condition.

W. Cheatham, Louisville, Ky.—Case of acute middle ear suppuration in the course of erysipelas.

Edw. J. Bernstein, Kalamazoo.—Serpiginous ulcer of cornea which showed signs of healing before fatal termination of case.

G. E. deSchweinitz, Philadelphia.—“I have seen a good many ocular diseases directly traceable to facial erysipelas. I do not know whether in any one of these instances, however, there was a positive relationship noted between the attack of erysipelas and the disease of the sinuses or nasal chambers.”

H. F. Hansell, Philadelphia.—“A number of cases have required enucleation of the eye as a result of extension of facial erysipelas into the orbital tissues, others have had permanent loss of vision from atrophy of the optic nerve. In none was the cause traced to diseased nasal chambers or accessory sinuses. Most of the cases were fatal.”

C. R. Holmes, Cincinnati, O.—Man, aged 46. History of alcoholic excesses. Pansinusitis, R. & L. Chronic case with frequent exacerbations of inflammations in frontals. External operation opening both frontal sinuses during acute attack. Erysipelas followed immediately. Severe attack lasting two weeks. Corneal ulcer.

Louis J. Goux, Detroit.—One case of facial erysipelas, due to infection through ulcer of septum. Acute attack of double otitis media.

Thos. Hubbard, Toledo.—“One case in which general facial

erysipelas originated in nares, causing a probable acute sinus infection and very severe eye involvement. There was more or less destruction of conjunctiva and even keratitis with areas of opacity, but function was not materially impaired."

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PURULENT AFFECTION OF THE LABYRINTH CONSECUTIVE TO DISEASE OF THE MIDDLE EAR PATHOLOGY.*

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The intimate study of suppurative invasion of the labyrinth is sufficiently modern to give it the zest which attaches to research and, even in as limited a field as the consideration of the pathologic processes incident to its implication in a suppurative disease of the middle ear, it is necessary to make the starting point from the normal and to include, in a preliminary review, such accepted facts in regard to the structure and relationship of the labyrinth, and such provisions as are accorded it for defense, as may have a bearing upon the changes incident to disease.

The labyrinthine capsule while fairly uniform in itself both as to its intimate structure and its relationship to the surrounding portions of the petrous bone, varies greatly in its juxtaposition to the neighboring tympanic cavity, this variation being due to irregularities in the contour of the tympanum, epitympanum and aditus and the differing degrees in which both the pneumatic spaces and their surrounding diploe encroach upon the base of the petrous pyramid, thus affording readiness of access of pyogenic material from the tympanic spaces to the labyrinthine capsule.

Another variable element which has to be considered, and which is especially important to the study of labyrinth necrosis and sequestrum formation, is the diploetic layer very nearly surrounding the labyrinth in the new born but gradually decreasing by the encroachment of more solid bone until, in the adult, contact suffices to make the labyrinthine delimitation almost impossible, in some places, and representable only by a slit-like line of demarcation in others.

Regarded from the tympanic side, the direction from which the form of attack, under present consideration, is made, the most vulnerable points would appear to be the windows, the horizontal semicircular canal and the promontory, the propor-

*Read at the 1907 meeting of the American Laryngological, Rhinological and Otological Society.

tionate degrees of vulnerability being perhaps fairly expressed, in the light of present knowledge, in the order in which these parts are named, though a still larger material than that thus far afforded and a more definite record of findings will be necessary to arrive at absolute determination, especially as the review must cover not only the more acutely destructive processes, incident to certain systemic conditions, but the slower, necrotic, abolition of sound tissue incident to prolonged suppuration of the middle ear.

Regarded structurally, in its relationship to a suppurative middle ear, the intact labyrinth presents a capsular environment jeopardized by relationship to the source of invasion, hazarded by anatomic approaches which penetrate its walls, and safeguarded from within, mechanically, by the extrusive force of its fluid contents. The jeopardizing relationships are those of the first whorl of the cochlea, in the promontory, the outer vestibular wall and the horizontal semicircular canal, the anatomic approaches are the oval and round windows and the vascular penetrations of the capsule, and the mechanical protection the constant outward pressure and, where penetration of the capsule has been effected by caries, the outflow of the perilymph, effectual only up to the point of general participation of the labyrinthine contents in the suppurative disease.

In the more limited caries the points of attack are those which are most favored by propinquity and by structural weakness, while in the more general necrosis the lines of least resistance are those which include, as constant factors, the oval window, on the outer, and the porus acusticus internus on the inner vestibular wall and, as a variable factor, the extent of the diploetic remnant enclosing the labyrinthine capsule.

The interstitial granulomatous process which constitutes the basis of a limited caries is especially forwarded by contour conditions, which permit accumulation of debris and the correspondingly unhindered activity of pyogenic organisms, while the still debatable question of relationship between the circulation of the periosteal submucosa of the tympanum and that of the intralabyrinthine periosteum, as on the promontory for instance, becomes of less importance in view of the rapid vascular proliferation which takes place when once the interstitial granulomata have become established. The fact that these new growths belong, functionally, to the class of extrusive granulomata, does not lessen their influence, as media for vessel

proliferation, in the gradual weakening of the underlying bony structure, or their facilitation of the invasion of such complicated soft tissue combinations as are found about the foot plate of the stapes.

The niche of the oval window, with the stapes in position, affords a favorable opportunity for the progressive development of a limited caries, both because of its contour and of the liability to the blocking, within it, of a pyogenic process favored by the engorgement of its exceedingly vascular soft tissues, while the tissues forming the substructure of the foot plate of the stapes and the propinquity of the nervi duct of the facial and of the ampullary enlargement of the semicircular canal, on the superior posterior niche wall, give ready access to the labyrinth interior when they have become perforated.

An element of defense, under these conditions, but one which can only be theoretically estimated, in default of more intimate clinical observations, is the tendency to outflow of perilymph which continues so long as an opening in the labyrinthine wall persists and the aqueductal communication pertains. In some cases of removal of the stapes, the labyrinth being intact, a steady outflow of perilymph has been observed for several days, gradually decreasing as the rent in the basal membranes closed and ceasing finally only when the repair was complete. In view of this fact it is at least supposable that, with a small opening through the labyrinthine capsule, the product of a limited caries, the tendency to outgrow would be measurably protective until a general pyogenic invasion of the labyrinth, with engorgement of the membranous structures, and the occurrence of fibrinous deposits, had cut off the aqueductal supply.

When once the labyrinth has become invaded, the spread of the inflammatory process throughout its intimate structures becomes rapid and complete, the interference with the vitalizing blood supply progresses and the negative process of necrosis tends to supplant the active invasive process of caries; the chronologic sequence, in any given case, being dependent both upon local structural and general systemic conditions; in the exanthemata of childhood the whole process, from the primary invasion of the labyrinth to a more or less extensive necrosis, may be very short, while in adults, as the result of a long standing chronic middle ear suppuration with cholesteatoma, it may extend over years, but however limited in area the true necrosis of the labyrinthine capsule may be, the participatory

effect upon the membranous labyrinth is generally one of complete destruction.

That the labyrinth windows afford an especial opportunity for the passage of infection from the middle ear into the labyrinth is evident both from their structure and from the literature describing the operative and postmortem findings in which intralabyrinthine suppuration was accompanied by destructive invasion of the vestibule through the medium of the opening, closed only by soft tissues and the base plate of the stapes, which includes so considerable an area of the outer vestibular wall.

The common clinical evidence of the frequency of limited caries, with redundant extrusive granulomata, in the niche of the oval window in cases of chronic, prolonged, suppurative disease of the middle ear is suggestive of the predeliction of this one of the anatomic pathways to the labyrinth, a predeliction in which the round window shares, though in a lesser degree, its position, the plane of its inclination, and its freedom from superimposed structures, rendering it less liable to attack than if it were placed at the bottom of a deep depression.

The view of Hinsberg, that a considerable swelling of the tympanic mucosa serves to protect the membrane of the round window, being directly controvertible by the fact that such a condition, by retaining pyogenic products, and favoring superficial ulceration, would tend to rob the membrane of the round window of its anatomic advantage.

Unlike the lining of the pneumatics of the mastoid, and of other portions of the tympanum, related thereto and to the tympano-pharyngeal tube, the covering of the inner tympanic wall, in the region of the windows and over the promontory, more especially, exhibits the characteristics which constitute the submucosa a periosteum, and it is here that the progressive sequences of superficial erosion, hyperemia, pathologic exudate, the interstitial granu'omatous invasion of caries and the secondary destruction of necrosis are most displayed. Friedrich says: "The most important evidence elicited in the examinations made by Panse, Habermann, Hänel, Manasse and myself is that the fenestral niche was filled with granu'omata and nascent connective tissue the stapes being frequently fairly embedded in masses of granulations which, furthermore, had destroyed the annular ligament and thrust themselves into the vestibule, while not infrequently, in addition to implication of

the stapes, its cartilaginous base and the bony rim of the oval window itself were extensively carious, and, (as might be expected from the complexity of the structures at the bottom of the oval niche,) the most varied pictures of the passage of the inflammatory process into the labyrinth were presented. The arms of the stapes were either partly destroyed or had disappeared altogether in the enveloping mass of granulations, the base plate of the stapes showed limited areas of caries on the tympanic side, or had been entirely destroyed, remnants only of the carious bone being found amidst the granulations; in one case the whole of the posterior superior niche wall forming the boundary of the nervi duct of the facial had been replaced by granulations."

The extent to which the membrane of the round window participates in permitting the access of septic products to the labyrinth is only with difficulty ascertainable, the configuration of its niche is much more variable than that of the oval window, especially on the anterior wall where the bony overhang is frequently such as to afford an opportunity for the accumulation of septic products.

It is this question of the accumulation of septic products which has an important bearing upon the invasion of the labyrinth, directly through its bony wall. Through the operation of the pathologic sequence already mentioned the two next most exposed portions, in their relation to the primary field of disease, are the promontory and the horizontal semicircular canal, but while the promontory is the most exposed it is also, from its position, the more amenable to drainage, affording a striking contrast to the semicircular canal which, often closely approximated to, if not abutting upon, the recessus epitympanicus, is in close relationship to a frequent seat of septic retention and granulomatous activity. It is but rarely, in the course of a prolonged suppuration in the middle ear, that the labyrinth is invaded by one channel alone and this is probably particularly true in those cases in which accumulations of desquamated epithelium have been either the covers for septic attack, or, by their presence, have contributed to lower the vitality of the attacked area, and the frequency of this form of complication of a protracted middle ear suppuration in the epitympanum, probably contributes to the greater frequency of fistulous penetration of the semicircular canal.

There is still considerable difference of opinion as to the

relative degree in which the semicircular canal is the seat of the primary invasive lesion, the discovery of a fistulous opening, through the medium of an exenteration, in default of substantiation of the integrity of other channels, being only presumptive evidence, since, wherever invaded, the labyrinth interior so rapidly participates, throughout, in the suppurative process; though Politzer cites cases in which the intralabyrinthine changes were limited to the region of the windows, and other observers report instances of limitation within the primarily invaded semicircular canal. The prognosis for a limitation of the suppurative process in the horizontal semicircular canal is favored by the readiness with which the limited area is blocked off by the results of the interior inflammation precedent to the actual fistulous opening; the limitation evolved by the inflammatory process in the vestibule is, on the contrary, exceedingly rare, as shown by the observations of Brieger, though Politzer has observed cases in which the changes in the vestibule were accompanied by only moderate alterations in the cochlea. In contradistinction to the opinion of Jansen, Politzer also regards empyema of the intradural prolongation of the aqueductus vestibuli as very rare, he having but once found suppurative products in the ductus endolymphaticus and once in the ductus perilymphaticus.

It is in the suppurative implication of the cochlea that the prognosis for limitation is least favorable, the various anatomic channels for the passage of septic material, the readiness in inflammatory participation of the diploetic structure of the modiolus, and the thinness of the multifariously perforated terminal wall of the porous acousticus internus, affording ready passage along the channel of the auditory nerve.

While even a cursory review of the augmenting literature of this subject shows the question of transference of a suppurative process from the middle ear to the labyrinth, to fall, with exception of certain mooted points, within simple lines, the question of suppuration within the labyrinth itself, of periosteal involvement, of attacking caries, necrotic delimitation and of the structural paths through which these pathologic changes are effected, is beyond the bounds, without undue lengthening of the present communication, and, a worthy subject for distinct consideration in another symposium.

Viewed from the standpoint of the middle ear, wherever the attack may be made and whatever the degree of distortion or of

destruction, the pathologic sequence is the same, from the superficial layer of the soft tissue lining of the tympanum inward, into and through the underlying bone; irritation, hyperemia, congestion, normal exudate, maceration, erosion, pathologic exudate, accumulation of detritus and formation of extrusive granulomata; separation of the periosteum, penetration of the outer cortical layer and suppurative extension through the Haversian canals, the destruction of the bone being further favored by the invasive interstitial granulomata, with their newly created blood vessels, and their blocking of the normal blood supply, producing a tissue change which is both a caries and a necrosis intimately combined. With penetration of the labyrinth capsule there follows separation of the endosteum and, with its penetration, and the sequent interior involvement, the invasive cycle is complete.

One element of the middle ear secretion which needs to be taken into consideration, for the part it may play in what may be called the mechanism of septic invasion of the labyrinth, is the mucin, that albuminoid substance which, in excess, imparts the peculiar ropy character to the tympanic secretion and so favors aggregations of septic detritus and provides a nidus for bacterial activity; it is precisely in such depressions as that of the fenestral niche that such an element may become effective in favoring a pathologic process.

Not only does the presence of mucin accord with bacterial development, but it may be itself a product of bacterial agency. Rettger,¹ in recent investigations shows that the production of mucin, or a mucin-like substance is not limited to one or a few species of bacteria.

There is considerable evidence that the process of mucin production, by bacteria, is not a direct one; there is, presumably, formed an intermediate body, a pseudo-mucin, to the presence of which the younger cultures owe their marked slimy consistency; as development goes on this peculiar substance becomes gradually transformed into the more soluble type of mucin, hence, as a rule, the older the culture the larger the amount of mucin contained in it; the rapidity with which the pseudo-mucin is transformed into the final product varying, to a large extent, with the bacterial species.

1. L. F. Rettger. Mucin as a bacterial product. *Journal of Medical Research*, Vol. X, p. 101.

A brief review of the systemic conditions favoring labyrinthine septicemia shows that the exanthemata of childhood, especially scarlet fever and measles, are acutely important, while of the more chronic disorders, tuberculosis, diabetes and syphilis are influential in frequency in the order given, and it is in the presence of these diseases that the necroses of larger area and the major sequestrae more commonly occur.

Klug¹ reports six cases in which there were nine labyrinth suppurations, five of the cases demonstrating the destructive influence of scarlet fever; in one case, in which the etiology was obscure, the predominating mechanical influence was cholesteatomatous.

In the first case a portion of the cochlea was involved; in the second there was a fistulous opening into the horizontal semicircular canal and pus issued on opening the vestibule; in the third the vestibule and cochlea were filled with pus and there was a small fistulous opening in the annular ligament of the stapes; in the fourth the sequestrum, removed from the left side, included the cochlea and a portion of the vestibule and of the semicircular canals, while on the right side, in the same case, there was merely a porous necrotic mass, which included the major portion of the labyrinth; in the fifth case the sequestrum, from the right side, included the three semicircular canals and a portion of the cochlea and that from the left side, two of the semicircular canals and one whorl and a half of the cochlea; in the sixth case the sequestrum, from the left side, included a portion of the vestibule and one and one-half whorls of the cochlea, the remainder of the sequestrum being an indefinable mass of disorganization, and, on the right side, there was a fistulous opening into the horizontal semicircular canal, a similar opening through the promontory and a corresponding suppurative implication of the canal and of the cochlea.

The pathologic changes in the labyrinth capsule, and its surrounding diploe, in uncomplicated chronic suppurative middle ear disease, are stated by Politzer² to consist in no more than abundant cell agglomerations in the bone cavities and in hyperemia, while, on the contrary, in tuberculosis and corresponding cachexiae and in sepsis, or with the cholesteatomatous

1. Klug, Les suppurations de labyrinthe. *Annales des mal., de l'oreille et de larynx*, February, 1906.

2. Politzer, Labyrinthbefunde bei chronischen Mittelohreiterungen. *Archiv. für Ohrenheilkunde*, Band 65, Heft 3-4.

complication of prolonged suppurative middle ear disease, more or less extensive defects in the bony capsule are determinable.

The descriptions, by various observers, of these changes, and the multiform combinations of different stages of the pathologic sequence which they present are strikingly illustrative of the variations in a process which may be either rapidly completed or may take years for its consummation, according to the relative balance between resistance capacity and the conditions attendant upon the invasion.

The convexity of the semicircular canal and the promontory have been found to be partially carious, wholly necrotic or exhibiting numerous small openings filled with penetrating granulomata, separated from the labyrinth interior only by the elevated endosteum, or, where this also had participated in the destruction, with an established communication between the septic middle ear and the perilymphatic space. The windows exhibited the greatest variety of changes, in some instances the stapes and its annular ligament remained intact, in others the ligament was variously perforated or entirely destroyed, the crurae were partly or wholly wanting, the base plate either carious in several places, on its outer surface, and either displaced or represented only by a small remnant of infected bone embedded in the swollen mucosa or in the mass of granulomata which had attained free access to the vestibule.

The membrane of the round window was enclosed in the swollen mucosa, in some instances greatly thickened, in others perforated, or entirely destroyed, and the lumen of the window filled with penetrating granulomata.

The pathologic changes within the labyrinth itself have been shown to be equally various, from a circumscribed area of exudate on the inner surface of the foot plate of the stapes and on the inferior wall of the vestibule, or organized connective tissue in the same location, the other portions of the vestibule remaining intact; to a partial or complete filling of the vestibule with pus, hemorrhagic exudate or highly vascular connective tissue in communication with the granulosomatous tympanic mucosa through the medium of the windows or of fistulous openings through the promontory or other portions of the bony capsule. Similar changes were found also in the cochlea and in the semicircular canals, in some instances the pus, entering

the basal portion of the cochlea, penetrated the tractus spiralis foramenulentus or made its way along the channels of the nerve fibrils or through created defects into the porus acusticus internus; in some instances the modiolus was mainly intact, in others almost completely destroyed and, presumably, the point of departure for septic incentive to multiple caries of the outlying labyrinth capsule.

In the majority of cases of implication of the cochlea the organ of Corti was destroyed, or at least so changed that the details of its structure were undeterminable.

One other very frequent accompaniment of the septic invasion of the labyrinth should not pass unmentioned, and that is the paralysis of the facial, incident to the penetration of its bony canal at some point in the relationship of its course to the septic middle ear or labyrinth. The proportion of facial paralyses, either partial or complete, as given by the two observers covering the largest amount of material in this respect, Gerber¹ and Bezold² varies from 77 per cent to 83 per cent, the most vulnerable points of the nervi duct, to access from the middle ear, being the region above the oval window and the superior portion of the posterior tympanic wall.

The proportion of cases of labyrinth implication in suppurative disease of the middle ear, as given by various observers, ranges from 0.77 per cent to 1.2 per cent, and the estimate of Friederich³ that there is one labyrinth implication in every hundred cases of suppurative middle ear disease presents, therefore, a fair general average of the results of present observations.

In view of the possibility of an increase of this percentage as this vital subject comes to be more generally and more intimately studied, and in view also of the evidence, already accumulated, of the extent of destruction within, and including the labyrinth capsule, when once septically invaded, the questions of symptomatic indication and of defined surgical procedure become of the greatest importance.

1. Gerber. Archiv für Ohrenheilkunde, Band LX.
2. Bezold. Zeitschrift für Ohrenheilkunde, Band XVI.
3. Friederich. Die Eiterungen des Ohrenlabyrinths.

THE SYMPTOMATOLOGY AND DIAGNOSIS OF LABYRINTHITIS, CONSECUTIVE TO PURULENT OTITIS MEDIA.*

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BALTIMORE.

The magnitude of the task I have undertaken fairly overwhelms me. When our Secretary, with sweet words and characteristically persuasive manner, invited me to take part in this symposium, I readily, yea, even gratefully, accepted, for I was proud of the privilege of appearing in company with Drs. Blake and Richards. For the time being I failed entirely to appreciate the fact that, with the honor, he had conferred upon me a heavy obligation. It appears to me now that the topic assigned to me is by long odds the most difficult portion of the subject; the pathology of purulent invasion of the labyrinth is fairly well worked out, or the missing links may be supplied by hypothetical reasoning, and treatment of the disease consists in the application of established surgical principles.

The diagnosis of a disease is the first, if not the most, important step in its consideration and the title of this paper would imply that the author should present such a clear-cut set of rules as would, upon application to a concrete example, enable one to determine with reasonable accuracy whether or not labyrinthine suppuration existed. Before you condemn me for failure to measure up to these expectations, I beg you to remember that much of the blame should fall upon Dr. Harris for having shown such lack of wisdom in selecting for this role the least capable of his performers. That I shall fail is inevitable, not only because my own experience with the disease has been, necessarily, limited, but because in the whole literature of the subject there is not, as yet, a sufficient number of accurate clinical records to permit the construction of a sharply defined clinical picture. No one man has ob-

*Read at the 1907 meeting of the American Laryngological, Rhinological and Otological Society.

served any great number of cases, and Gerber, in 1906, was able to find only 90 satisfactorily recorded cases. You will pardon me, therefore, for supplementing my limited personal knowledge of the disease by frequent reference to the published experiences of others.

The publications which I have found most helpful in this study, and the reading of which will well repay anyone interested in the subject, are: "Sur le diagnostic et le traitement des suppurations du labyrinthe," Vc Stein, *Ann. d. mal. de l'oreille*, etc., 1905, XXXI, p. 30; "Labyrinthnekrosa," Gerber, *Ar. f. Ohrhkl.*, 1904, LX, p. 32; and, that most excellent monograph, comprising a resume of the entire subject of labyrinth suppuration, of Friedrich, "Die Eiterungen-Krankheiten des Ohrlabyrinthe." From these I have abstracted freely.

Bezold estimated that there is but one case of labyrinth necrosis in 500 cases of chronic purulent otitis media; a surprisingly small percentage when one considers the large number of existing cases of chronic middle ear suppuration which are absolutely neglected for long periods of time. A possible explanation of the small number of cases seen lies in the fact that the disease occurs most commonly in the first decade of life, and we all know how frequently the ear is overlooked in children suffering from grave pyemic conditions. Of the 90 recorded cases, according to Gerber, 37 occurred in children under 10 years of age; his table being arranged as follows:

1 to 10 years old.....	37 cases.
11 to 20 years old.....	15 cases.
21 to 30 years old.....	16 cases.
31 to 40 years old.....	7 cases.
41 to 50 years old.....	8 cases.
51 to 60 years old.....	5 cases.
61 to 70 years old.....	2 cases.

A further explanation is found in the mistakes of diagnosis, particularly because of the difficulty of distinguishing between labyrinthitis and cerebellar abscess. It is fair to presume that many of the fatal cases of ear disease in which the diagnosis of meningitis or cerebellar abscess was made, and upon which no autopsy was performed, had really passed through the stage of labyrinthitis or were instances of abscess localized in the labyrinth rather than in the cerebellum.

Chronic suppurative otitis is almost always the character of the middle ear disease preceding purulency of the laby-

rinth; very rarely does the inner ear become involved during the acute stage of otitis. There is no fixed period of chronicity, however, necessary to allow the deeper invasion, and the time intervening, in the reported cases, varies from 6 weeks to 31 years. One case has come under my own observation in which the otorrhea had existed but 5 months and the history indicated that the first evidence of labyrinthine trouble, a severe attack of vertigo, with tinnitus, nausea and deafness, appeared when the middle ear disease was only two months old.

As predisposing factors, some constitutional dyscrasia or the exanthematous fevers are generally present; tuberculosis and diabetes, scarlet fever and measles, being the most frequently noted. There is no difference in vulnerability as regards sex, nor between the right and left ears. The extent of destruction in the 90 studied cases shows:

Necrosis of entire petrous portion of temporal bone....	7 times
Complete labyrinth necrosis	17 times
Complete cochlear necrosis	19 times
Partial cochlear necrosis	26 times
Necrosis of parts of cochlea and labyrinth.....	10 times
Labyrinth necrosis without reference to cochlea.....	5 times
Necrosis of semicircular canals alone.....	2 times
Extent of process not known	4 times

It will be noticed that the cochlea was concerned in 79 out of 86 cases, and that the lesion was limited to the cochlea in 50 per cent of all the cases. If, in addition to this, we consider the further fact that it is the first convolution of the cochlea which is most frequently affected, we have a confirmation of the clinical observation that the round window is the weakest point of the inner tympanic wall and the most frequent route of labyrinthine invasion.

A detailed study of the symptomatology of purulent otitis interna, (suppurative labyrinthitis), may be facilitated by treating under separate heads the general and special symptoms, and the latter will have to be considered as subjective and objective phenomena.

GENERAL SYMPTOMS.

1. *Fever.* The febrile condition in this affection shows nothing characteristic. Instances of the most extensive and diffuse destruction of the labyrinth are recorded in which the temperature was never a full degree above normal at any time during the illness. Subnormal temperatures have been noted not infrequently and in at least one case continued so until

within a few days of death. With the previously long existing suppuration in the tympanic cavity, to which the system has become more or less adjusted, and the slowly progressing attack upon the structures of the internal ear, we might expect that the labyrinthine disease would advance without material febrile disturbance. That is what usually happens. The attention of the otologist is attracted to the spread of purulent otitis to the inner ear not, as in other complications, by temperature changes but by distinctly aural symptoms, and, when in the course of labyrinthitis a marked fever arises it is an indication of the appearance of intracranial complications, usually leptomeningitis.

2. *Headache.* This is a common accompaniment of all forms of temporal bone inflammation, and especially of their cerebral complications, so that it can not be regarded as of much importance in the recognition of labyrinth disease. Some degree of earache or headache, occasionally acute pain but more often a dull sense of soreness in the head, is present in most cases. There is a general agreement that very violent pains in the ear and head precede sequestration of a necrotic labyrinth; the pain disappearing after expulsion of the sequestrum.

3. *Nausea and Vomiting.* Like the above named symptoms, nausea and vomiting, considered alone, are of very little diagnostic value. It is only when occurring in connection with the other symptoms of Meniere's group that any importance attaches to their consideration. Bezold long ago pointed out, however, that giddiness, nausea and vomiting occurred in the early stages of labyrinth necrosis and that their appearance in a case of chronic suppurative otitis media is always suggestive of beginning labyrinthine involvement. The primary attack of vertigo may be, and frequently is, very violent, necessitating the patient's confinement to bed. In one of my own cases the patient had two such attacks, each of which kept her in bed for more than a week. These, as well as the other evidence, of disturbed equilibrium, tend to diminish in intensity, or to disappear, as the disease progresses; being dependent upon irritation of the vestibular apparatus, they are not repeated after the disease has destroyed the nerve terminals in the ampullae. The possibility of giddiness and nausea being produced by strictly intratympanic disease must not be overlooked. We have all observed cases of this sort.

SPECIAL SYMPTOMS AND THEIR INVESTIGATION.

1. *Tinnitus Aurium*. Complaints of subjective auditory sensations are surprisingly rare in disease of the labyrinth consecutive to purulent otitis media and when occurring seem to be of temporary duration only. The omission of reference to tinnitus in the reported cases is particularly striking in view of the fact that this symptom is so constant a factor in other diseases of the labyrinth. Bezold found it recorded in but 3 of 41 published cases, and did not observe it at all in 5 cases under his own care. Buzzing, humming and ticking are the sounds generally described, but, in a few cases, there have been extremely loud noises—like the puffing of a locomotive. Hinsberg suggests that the acoustic phenomena of irritation may not have been absent in all the cases in which they were not mentioned, but Friedrich's explanation seems the more probable—that "with the gradual development of the clinical symptoms of labyrinth suppuration, ear noises do appear in the beginning as irritation symptoms which, later on, disappear with the destruction of the nervous apparatus."

2. *Impaired Hearing*. Recalling the fact that the cochlea is the part of the internal ear primarily affected in the majority of cases, and that it is injured to some degree in 90 per cent of all cases, we are prepared to expect that deafness should be one of the most regular symptoms of labyrinth suppuration. Gerber says that in 67 of the cases tabulated, in which the defect of hearing was recorded, there was complete deafness in 43, and some remnant of hearing only in 22. Accurate proof of the amount of hearing retained is not easily obtainable. The objective tests of the examiner are to an extent controlled by the subjective sense of the patient, and the way is open for inaccuracy and false deductions. Furthermore, even with the greatest care, and when dealing with a helpful patient, it is extremely difficult to make sure of occlusion of the other ear. In fact, it is practically impossible to completely shut out the good ear. One must, therefore, be very cautious about accepting evidence of remaining hearing in a case where other symptoms point to extensive destruction of the sound perceiving organ. Especially is this true of the employment of the voice, as a testing medium, and of the higher tuning forks.

The functional defects characteristic of labyrinthine disease are: impaired bone conduction, as tested by the tuning fork;

reduction of the range of audition, the loss being perceptible from both the lower and upper ends of the scale; diminished air conduction, so that the Rinne test proves negative; and, lateralization of the Weber test towards the unaffected ear. Total destruction of the cochlea means total deafness. Partial destruction of the cochlea may leave still some hearing power for the middle register, but even here the duration of both air conduction and bone conduction will be reduced. One can imagine invasion of the internal ear through the semicircular canals without material impairment of hearing for the higher notes, because the perceptive apparatus has not been seriously attacked, but autopsy examinations prove this condition is very uncommon, at least in the graver cases that have come under observation.

3. *Coordination Disturbances.* There is apparently some difference of opinion as to the frequency of these symptoms, giddiness, nystagmus, vertigo and nausea. Bezold seems to believe that to some extent they accompany most cases, while Gradenigo holds that they are absent in many cases. The latter finds such symptoms unrecorded in just about the same percentage of cases as are known to have the lesion confined to the cochlea, and suggests the probable correspondence of the conditions. That is, that when necrosis is limited to the cochlear portion of the internal ear there will be no disturbance of coordination. On the other hand, it must be noted in this connection that in some instances of undoubted semicircular canal affections there has been complete absence of any disturbance of equilibrium.

Friedrich endorses Bezold's view and considers equilibrium disturbances to be, next to impaired hearing, the most constant symptom of labyrinth disease. He includes among such disturbances: giddiness, standing or walking, with closed or open eyes; vertigo, even in the position of rest; horizontal nystagmus, appearing especially when glancing towards the healthy side; and attacks of nausea and vomiting. He believes that they are but temporary phenomena and never assume a permanent character. That there may be cases which, because of the very slow advance of the carious process, never show these symptoms, he admits. Although Bezold is accredited with the opinion expressed above, his statistical report of 46 cases of labyrinth suppuration includes only 12 cases in which attacks of giddiness were reported. Friedrich supports his contention

by reference to the investigations of other workers. as well as his own clinical experience. Thus, Jansen found giddiness present in 72 per cent of his cases of carious and traumatic lesions of the labyrinth; Lucae, in 60 per cent; Hinsberg, in 86 per cent; and Friedrich, himself, in his 27 cases of labyrinth suppuration, found that giddiness was present 16 times, absent 8 times, and the records were missing for 3 cases.

The subjective vertigo complained of is the sensation of falling towards the healthy side or the turning about of neighboring objects. When walking, there is giddiness and uncertainty of movement. When lying down, giddiness and the fear of falling out of bed.

To test the sense of equilibrium, Von Stein has offered us two special devices, the movable inclined plane and the revolving chair, both of which instruments are designed for the purpose of determining accurately the angle of relative position or the degree of rotation required to produce disturbances of sensation. In a very recent article, after relating an interesting case, he says, however, "total or partial necrosis of the labyrinth is always accompanied by troubles of co-ordination which are most marked during the jump with the eyes closed. To provoke these symptoms, and bring about a diagnosis in this way, one has no need for special apparatus. All that is necessary is to make the patient walk and jump with the eyes closed. But, to search out a complete diagnosis, and to approximate in figures the degree of these troubles, one should use the goniometer and centrifugation, without which it is impossible to make a diagnosis in the initial period." From this it would seem that he has come to the same conclusion as all others who have tried the inclined plane test, namely, that it affords very little assistance in making a diagnosis. The goniometer, which provides for rotary motion and sudden stoppage, is not only a scientific application of this simple test, which can be made with any revolving chair, but affords a means of measuring such rotations, and the effects produced, that may come to be helpful in determining the existence of a lesion in its early stage, or, of locating it in the bony capsule, perilymphatic space or membranous capsule.

At the present time, then, our tests of equilibrium are about as follows:

- a. Standing, with open and then with closed eyes, to note unsteadiness of position.

b. Walking, with open and then with closed eyes, noticing a tendency to ataxic gait or divergence from a straight line; the tendency to walk in a curve, generally.

c. Jumping, feet and knees in apposition, and eyes closed, to ascertain any tendency to fall toward the affected side.

d. Turning the patient around and bringing the body to sudden stoppage. This should be done first toward the sound side and then toward the affected side to note any complaint of giddiness, this sensation being most likely to be produced with rotation to the diseased side.

One other test for muscular incoordination is that of eliciting nystagmus. The patient is never conscious of nystagmus and, while it has been observed in a large percentage of the reported cases of labyrinth disease, the physician has to search for it. If the patient be directed to turn the eyes strongly toward the sound side and then upwards, the oscillating movement may be seen, if at all, during the time the eyes are held in such position; the nystagmus in these cases is always of the horizontal, oscillating type, never rotatory.

4. *Facial Paralysis.* Bezold looked upon facial paralysis occurring in connection with long-standing suppurative otitis media as a reasonably sure sign of extension of the latter disease to the labyrinth. Friedrich takes issue with him on this point, for in his 27 cases of labyrinthine suppuration facial paralysis was present in only 3, at the time they came under observation. The symptom is of diagnostic value only when co-existing with labyrinthine deafness and disturbances of co-ordination.

5. *Intratympanic Appearances.* Consideration of the tympanic pathologic alterations is not properly a part of this symposium, but it would be manifestly improper to omit all reference to the disease precedent to and causative of that which we are discussing. It will probably be sufficient to say that, to complete our symptomatology, as regards gross pathologic changes in the tympanum, very little information of diagnostic importance can be obtained by their inspection, and that it is, usually, only during an operation that we can inspect the inner tympanic wall sufficiently well to locate any carious lesion. Pus exuding from the oval window or from the promontory, particularly if it rapidly reappears after being wiped away, is positively diagnostic of the labyrinthine invasion, and the appearance of granulation tissue springing from the inner wall,

with roughened bone underneath, is characteristic of necrosis of the labyrinth capsule.

DIAGNOSIS.

A positive diagnosis from preoperative study of our cases can seldom be made. In the majority of instances, treatment must be instituted upon the basis of a probable lesion, the proof of whose existence depends upon an exploratory operation. Even when the internal wall of the tympanum is exposed, it will require the most careful research to find the portal of entry or exit of inflammatory products. Granulations protruding from the oval or round windows may be recognized but carious fistulae are not so readily discovered; they must be sought with a fine probe. When they can not be found, it may occasionally be observed that the semicircular canal wall presents a bluish or brownish discoloration, due to the appearance of granulations or blood-clot as seen through the thin bony covering.

The natural sequel of untreated purulent otitis interna is death by leptomeningitis or encephalitis. Consequently, as most of the observed cases are the result of neglect, we have to make a differential diagnosis between labyrinthitis and the intracranial complications of otitis media. In leptomeningitis we have to guide us, the characteristic, persistent high fever and the changed appearances of the cerebro-spinal fluid, as examined after lumbar puncture. In cerebral abscess, without localizing signs, low temperature, subnormal at times, accompanied by slow pulse, is perhaps the most reliable symptom. Cerebellar abscesses are still more confusing in that headache, vertigo, vomiting and coordination disturbances are the prominent symptoms.

One is strongly tempted, Mr. President, to take the symptoms enumerated above and try to draw some distinct picture which he could call a clinical entity and to it attach the name of—suppurative otitis interna, or, purulent labyrinthitis. I shall deny myself that joy. The whole subject is, as yet, in too chaotic a state. And, if it were possible, I do not know that it would be wise to draw such a picture at the present moment. David Grayson, in one of his interesting stories on "Contentment," recently described this instinctive desire for completeness in the following words: "No conclusion ever quite satisfied me. I always knew there was something yet remaining to be told. The only safe conclusion we can reach is this:

Life changes. How strange it is, then, that we should be content to take such small parts of it as we can grasp, and to say, 'this is the true explanation.' By such devices we seek to bring infinite existence within our finite egoistic grasp. We solidify and define where solidification means loss of interest." Anything that might tend to check interest in this problem at the present time would be fatal to our study of one of the most obscure and dangerous complications of purulent otitis media.

XLI.

TREATMENT OF PURULENT AFFECTION OF THE LABYRINTH CONSECUTIVE TO DISEASE OF THE MIDDLE EAR.*

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The following paper is based upon 11 cases of labyrinthine suppuration and necrosis. Of these, four occurred in the course of acute or subacute mastoiditis; seven, in the chronic suppuration. In *four*, neither were symptoms present, nor was there anything in the previous histories suggesting inner ear involvement; the labyrinthine invasion was discovered at the time of the mastoid operation.

In *three*, no symptoms were present at the time of operation, though the previous history in each pointed to labyrinthine disturbance.

In *four*, decided symptoms were present at the time of operation.

In *three* of the eleven cases, infective sinus thrombosis complicated the labyrinthine disease. In two of these the jugulars were thrombosed.

This relative frequency of sinus involvement is of surgical interest when we consider the vascular connection between the veins of the vestibule, the semicircular canals and the lateral sinus, and those of the cochlear and the inferior petrosal.

Three of the eleven cases died. The first death was from meningitis resulting from operative interference. The second death occurred in one of the sinus thrombosis cases and was due to meningitis resulting from operative interference. Though the sinus was occupied by an infected clot, the thrombosis was not an important factor in the patient's death, as the post-mortem revealed the pathway of infection to be from the labyrinth along the course of the auditory nerve. The third death occurred in one of the sinus thrombosis cases and was due solely to the infective thrombosis. In this instance the jugular was occluded by an infected purulent clot

*Read at the 1907 meeting of the American Laryngological, Rhinological and Otological Society.

which extended below the clavicle into the deep thoracic portion of the vein, it being impossible to get below the cardiac limit of the clot. In this instance the labyrinth was in a perfectly healthy condition and had been so for a period of over ten days before the development of the sinus symptoms. The first two deaths resulted from improper technic and the specific errors—for the sake of emphasis—will be referred to in their respective places. I regard these deaths as sacrifices which could now be avoided.

The labyrinthine capsule showed the following lesions:

In five, the only visible lesion was a loss of the prominence of the horizontal semicircular canal.

In one, the oval window was the seat of fistula through which granulations protruded. The vestibule, the semicircular canals, and the lower half of the first cochlear whorl were involved.

In one the prominence of the horizontal canal had disappeared, the oval window was perforated and filled with granulations; a second perforation was present through the center of the promontory, through which polypoid granulations sprouted and pus oozed. The canal system was filled with granulations, the vestibule and cochlea with granulations and pus.

In three, the horizontal semicircular canal had disappeared and the oval window was the seat of fistula and filled with granulations. The canal system, the vestibule and the cochlea were involved in each.

In one, there was a perforation just above the horizontal semicircular canal in the region of the solid angle. The inner vestibular wall was also the seat of a fistula which communicated with a large epidural cerebellar abscess in the vicinity of the internal auditory meatus. The entire labyrinth was involved in the purulent process, which had also destroyed the greater part of the petrous pyramid, necessitating its removal.

Of the 11 cases, therefore, the horizontal semicircular canal, either alone or in combination with other lesions of the capsule, was involved in nine.

The oval window was perforated in five; the promontory, or first cochlear whorl, in one.

The labyrinthine capsule in the solid angle of the semicircular canals in one.

The inner vestibular wall was perforated once.

In all, there were seventeen perforations in the eleven cases, sixteen through the outer labyrinthine wall, but one through the inner. This is of surgical importance, and one of two conclusions is evident—either in the great majority of cases the labyrinth is invaded by direct extension through the capsule from without, or else the outer wall of the labyrinthine capsule is exceedingly more vulnerable than the inner. Both are true.

The cases show conclusively that the fistulous openings in the external capsule do not always represent avenues of invasion from without inward, but avenues of escape through which pus is successfully discharged from the labyrinth into the middle ear.

In every instance in which the vestibule has been involved the canal system and the cochlea—either in whole or in part—have been involved also.

The first question which, from a surgical standpoint, we are called upon to decide—and it is one with which we are frequently confronted—is the following: If after the diagnosis of labyrinthine suppuration is made we operate and find in the outer capsule of the labyrinth no fistula, shall we explore it upon the symptoms, fork tests, etc.?

To take a correct surgical attitude with reference to this important point, we will consider first, briefly, the diagnostic value of certain chief symptoms and tests; second, the dangers which attend the exploration of the labyrinth; and third, the dangers which attend the non-exploration of the labyrinth. I trust that a brief reference to the surgical value of the first will not be misinterpreted, in the present paper which is concerned chiefly with the treatment of labyrinthine suppuration.

1st. In the vertigo, vomiting, nystagmus and disturbances of equilibrium of labyrinthine origin, there is nothing characteristic.

2d. Even if we can exclude cerebral and cerebellar disease and can fix these symptoms definitely upon the labyrinth, they are not indicative of actual invasion of the labyrinth; they merely signify disturbance of labyrinthine function; but this occurs with comparative frequency from causes entirely extra-labyrinthine: from polypi, cholesteatoma, pus in the middle ear under pressure, etc.

3d. The mere fact that these symptoms are associated with a suppurative process is of little diagnostic value, as the extra-labyrinthine causes which produce these symptoms by trans-

mitted pressure are, as a rule, associated with a suppurative process also.

4th. Cases occur, presenting all the above symptoms and in addition fork tests, which, according to orthodox interpretation, point to labyrinthine involvement which when operated upon show no evidence of labyrinthine involvement in the outer capsule, and which completely recover without having the labyrinth explored; these cases are not uncommon.

5th. In my own cases the forks have been of doubtful value in differentiating middle ear from labyrinthine lesions.

Briefly: seven of the eleven cases lateralized to the side of the labyrinthine lesion. In six bone conduction was not shortened in duration. Of seven in which the greater part of the entire labyrinth was removed, four not only lateralized to the side of the labyrinthine lesion and bone conduction was not shortened in duration, but by air conduction forks were heard throughout a considerable range of the scale.

6th. In every case in which I have seen the labyrinth encroached upon by either operation or disease, the organ has been rendered valueless for practical purposes of hearing. I refer also to several cases of acute mastoiditis in which I have seen the horizontal semicircular canal injured by accident, and which cases I have had the opportunity to examine.

7th. To expose the interior of a normal labyrinth to an infected cavity is highly dangerous to life. What the mortality is under these conditions, I do not know, as I am unacquainted with the literature of this subject; but from my own experience, I realize that the opening of a diseased labyrinth is a serious thing, and I am confident that it is far more dangerous to open a normal labyrinth in the presence of an infected cavity than a diseased one; for in the latter the pathways along which infection may travel to the intracranial cavity and sinuses have had the opportunity to become sealed through inflammatory processes.

8th. If we do not explore the labyrinth under the conditions mentioned, we may overlook certain cases of labyrinthine supuration—for my own cases show conclusively that the labyrinth is not always invaded directly from without by encroachment upon the capsule, but that it may be infected by septic particles being transmitted to its interior along the avenue of the vessels, the outer capsule showing no perforation whatever, i. e., by a process of local metastasis. The pathologic

process is analogous to that in which infection of the sigmoid sinus occurs from the antrum along the avenue of the communicating vessels, the intervening mastoid structure showing no apparent involvement.

Should we overlook such a case, we court two dangers:

1. Intracranial infection taking place along the communicating avenues with the labyrinth.
2. That the inner wall of the labyrinth will perforate before its outer wall.

With reference to the first: of the eleven cases mentioned three had infective sinus thrombosis. This relative frequency throws some suspicion upon the labyrinth as a causative factor, for this proportion of sinus infections is entirely too high for the ordinary run of suppurative cases either acute or chronic.

That the infected labyrinth was responsible for one of the infected sinuses is probable, inasmuch as the symptoms of sinus involvement appeared six weeks subsequent to the cessation of aural discharge. This is suggestive of the role played by the communicating avenues from the labyrinth as infection carriers to the intracranial cavity, and the danger of overlooking such a labyrinthine suppuration.

The frequency with which the cerebellar fossa is found post-mortem to be the site of greatest pathologic activity in cases of purulent leptomeningitis, originating from suppurative disease of the petrous pyramid, is also suggestive of the important part played by the labyrinth as a distributing center of infection to the intracranial cavity.

With reference to the second—That the inner labyrinthine wall will perforate before the outer, is not borne out by clinical fact, nor, would we suppose it on anatomic grounds.

Of the seventeen perforations in the labyrinthine capsule in the eleven cases, sixteen were through the outer wall, but one through the inner wall. This ratio of sixteen to one is, of course, misleading, inasmuch as the majority of labyrinthine infections occur by direct extension through the capsule from without, under which circumstances the inner wall of the labyrinth is not subjected to a comparative test of vulnerability.

Considering, however, the doubtful value of symptoms as indicative of actual invasion of the labyrinth, the difficulty of eliminating cerebellar disease, the unreliability of tuning forks in differentiating in this class of cases middle ear from laby-

rinthine lesions, the practical certainty that we will destroy the organ for the purpose of useful hearing, the actual danger to life should we commit the error of opening a normal labyrinth to an infected cavity, the certainty that the outer labyrinthine wall will in the great majority of cases perforate before the inner wall—the correct surgical attitude is, not to enter the labyrinth upon symptoms, etc., alone at the primary operation unless there is direct evidence that the labyrinth is involved. While I can imagine a combination of symptoms and circumstances which would cause me to open the labyrinth at the primary operation, even in the absence of recognizable labyrinthine invasion, I have as yet met no case which presented such features, and it is to be sincerely hoped that the labyrinth will not suffer the indignity of reckless exploration and that it will not be entered without due consideration of the possible results to life.

What route shall we adopt?

The following facts have bearing upon the selection of the route by which we enter the labyrinth. From a surgical standpoint the cases may be divided into two classes.

Of the first class, the first five cases are illustrative, in which a loss of the horizontal semicircular canal represented the only lesion in the capsule. These cases represent caries of the labyrinthine capsule in which as the extension proceeds from without inward by a process of erosion, the limit to which the labyrinth is surgically involved is, as a rule, represented by the carious area. In such cases we merely remove the carious area and follow it to its limit, and the route which we select depends upon the site of the lesion, which, as a rule, is in the horizontal semicircular canal. The reasons for the frequency with which the horizontal canal are involved are evident.

1st. The external semicircular canal, unlike the posterior and superior canals which lie deeply embedded, juts out upon the floor of the aditus as a small ivory-like hump and is exposed to the suppurative process.

2d. Its exposure occurs at the point of greatest constriction between the tympanic and antral cavities, and at a point of great pathologic activity. The canal is not only subjected to the action of pus but to the deleterious combination of pus under pressure.

3d. The aditus is an unyielding bony ring in the circum-

ference of which the external semicircular canal represents one of its weakest points and it succumbs accordingly.

4th. The vulnerable point in the external semicircular canal is not at the extreme apex of its arch—the point of greatest exposure—but at a point several millimeters below the summit of its ivory-like cap. This is due to structural differences at the points mentioned and to the fact that the base of this ivory-like hump is encroached upon or surrounded by a mass of cancellated bone which is easily disintegrated and in these cases always diseased.

I have seen no instance in which the extreme apex of the arch has been eroded; in every instance in which the canal has been involved the entire cap has disappeared.

In chronic suppurative cases we frequently have the opportunity to observe the effect of this undermining process as it has attained to different degrees of encroachment upon the lumen of this canal.

We find that the prominence of the canal presents at its base a thin, sharp edge so undermined that it would appear that by placing the finger-nail beneath it we could separate it as a little thin shell.

The manner of invasion in these cases is evident—the labyrinth is opened by a process of gradual erosion from without.

Of the second class, the remaining six cases are illustrative. In these the labyrinth is involved in a true suppurative process, and its various compartments are filled with granulations or pus, or both. These cases are in every way more formidable, more destructive and widespread, and more highly infective than the first and require bolder intervention. The vestibule is the site of greatest pathologic activity, and in every instance in which I have found the vestibule involved, the canal system and the cochlea, either in whole or in part, have been involved also. This suggests the oval window as the most common avenue of entrance in the second class of cases, and this is in accordance with the pathologic findings in the capsule as shown in the previous cases. In the true suppurative cases the oval window was perforated in every instance with one exception. We may also have in an individual case the two pathologic processes mentioned at work at the same time.

Inasmuch, therefore, as the exploration of the canal system,

involving to greater or less extent its sacrifice, is necessary in this class of cases, the route which we adopt resolves itself into the selection of that which from a manipulative standpoint is the most convenient, which least endangers the important structures in surgical relation, and which allows us to fully expose the limits of the disease. The only route which fully meets these requirements is posterior to the facial nerve, and the point through which it is safest to enter the labyrinth for reasons to be mentioned later, is the solid angle of the semicircular canals.

We prefer to enter the vestibule posterior to the facial nerve instead of anterior to it, for the following reasons:

1st. When the vestibule is involved, the semicircular canal system, in the great majority of cases, is involved also. This necessitates its exploration, which entails its sacrifice.

2nd. The sacrifice of the canal system, even though it is not extensively involved, creates only an ephemeral disturbance and adds no danger to life, as the canal system is not in important communication with the intracranial cavity except by way of the vestibule.

3rd. We secure the maximum amount of working room, the advantage of which can be appreciated only when we have attempted the actual operation; and we are better enabled to work in the axis of the petrous pyramid, which is the direction of greatest safety.

4th. We get a field unsoiled by blood and gain a clear conception of the condition within the vestibule, of the ampullary areas of the canals, and of the inner vestibular wall.

5th. The route anterior to the facial nerve does not permit an exploration of the canal system which we know as a rule to be involved, nor of the ampullary areas, nor of the major part of the inner vestibular wall, but only of its lower anterior portion—consequently fistulae through the inner wall of the vestibule may be overlooked; I have had one such case in which had I adopted the anterior route, I would have committed this error and sacrificed the patient.

6th. It is based upon the erroneous idea that drainage is the chief desideratum and will suffice. Mere drainage in this class of cases will not suffice, for not only is the interior of the labyrinth involved, but its capsule is, as a rule, profoundly diseased and such portions of it must be removed. In addition

the complicated system of channels represented by the labyrinth cannot be satisfactorily drained from any one point as from an opening in the outer vestibular wall.

That drainage through a given point will not suffice is shown by the fact that in many of these cases the outer capsule contained multiple fistulae—yet with multiple fistulae present, drainage was not accomplished. The mere existence of multiple fistulae, properly interpreted, is a plea for more efficient drainage than can be accomplished by this means. The attempt to drain the labyrinth through an opening in the outer vestibular wall, while it may in certain instances succeed, is comparable to the attempt to relieve cases of suppurative mastoiditis by merely opening the antrum. We should make the effort to place the present operative procedure upon a thoroughly scientific basis from the first.

7th. From a manipulative standpoint the anterior route is far more dangerous; it is the more cramped; the anterior canal wall interferes seriously with manipulation in the upper portion of the cavity; we are working in a blind pit and are forced to do considerable work from without inward, the direction of greatest danger; first, as the dome of the jugular bulb may rise high, undermining the outer vestibular wall; and second, as the inner wall of the vestibule bulges outward at this point, making the anterior portion of the vestibule comparatively narrow from within outward, an injury to the internal auditory meatus is a much more probable accident.

What are the steps of the technic?

As a description of the complete exenteration of the labyrinth will embrace the various steps, that alone will be mentioned.

1st. A Schwartz-Stacke operation, by which we secure the maximum amount of working room, and in which we exenterate the bony angle included between the groove of the sinus knee and the under surface of the middle fossa, which better enables us to work in the axis of the petrous pyramid. We lower the facial ridge to its absolute limit, remove the fringe of bone on the anterior aspect of the facial ridge back to the descending limb of the facial nerve, remove the outer wall of the hypotympanum, and lower the level of the canal floor, securing by these steps the maximum exposure of the outer wall of the vestibule, and the dome of the jugular bulb should it rise high.

As exploration of the cochlea may be necessary, it is important that we see the exact position of the carotid artery by the exposure of its canal. In consequence we shave down the convexity of the anterior wall of the auditory canal, remove the lip of bone overhanging the mouth of the tube and evulse the tensor tympani.

This exposes the tube to curettement by which we relieve the field of blood, and it gives the maximum width to the apex of the cavity. Should the consistency of the bone permit, the arches of the semicircular canals should be delineated. This enables us to work with accuracy. (Fig. II.) The cavity should be cleansed; the tube packed with adrenalin gauze; the field rendered bloodless; the instruments and hands re-sterilized.

We next remove the prominence of the horizontal semicircular canal; it is a treacherous structure. The cutting edge of the chisel is placed at a point below the summit, but well above the level of the Fallopian canal, for this prominence separates along definite planes of cleavage, and as the outer lip of this semicircular canal is intimate with the Fallopian, a fissure in the former may extend out into the latter. Should the plane of cleavage be on a level with or below the Fallopian canal, the facial nerve may either be exposed by having its roof removed, as shown in Fig. X, or else completely undermined (Fig. V), under which latter circumstances we may definitely expect paralysis for it will ensue. The stroke should be made in a direction corresponding to the plane of the canal. The remaining canals are next uncapped, and the condition of the interior is noted. It will be found that the interior of the external semicircular canal most frequently of all shows pathologic change. In opening the superior canal a curved gouge should be used. It permits the stroke to be made in the direction of safety. The danger arises from the non-support of this canal by solid bony structure.

Owing to the contrast between the dark interior of the canals and the brilliantly illuminated white bone surrounding them, the labyrinthine fluid may appear dark and be mistaken for blood or granulations; we should not be deceived by this illusion.

We next enter the vestibule through the solid angle of the semicircular canals by creating at this point a conical pit with

its apex directed inward and gradually lowered until it enters the vestibule. As it is necessary to remove the inner lip of the horizontal semicircular canal, during this step the chisel should be held perpendicular to the plane of cleavage, and under no circumstances should it impinge upon the outer lip, which is intimately associated with the Fallopian canal, together with which it is left as a bridge carrying the nerve which spans the vestibule. (Fig. IV.)

The opening in the vestibule is now enlarged until a full exposure is obtained of this portion of the cavity. Its inner wall should be searched for fistulae. In enlarging this cavity no pressure should be made upon the bridge. For this reason a curette is a dangerous instrument. A small sharp gouge is safer.

Owing to widespread necrosis, it is necessary in some instances to sacrifice the bridge of bone carrying the facial nerve. To accomplish this without injury to the facial, we select a curette with its cutting edge turned backward, utilize the superior rim of the bone cavity as a fulcrum and shave off from above downward in a direction parallel to the course of the nerve, the roof of the Fallopian canal, thus leaving the nerve exposed in its gutter of bone, from which it may be separated and lifted without injury. (Fig. VI.) Any filaments given off from the nerve should be cut and not torn from this structure, as unnecessary traumatism is committed. We next remove such portions of the bridge as are necrotic, but no more, for the nerve here represents a curve, and should it lose the entire support of its bony gutter, it apparently elongates and consequently sags or kinks and becoming enmeshed in this vicious position by the granulations, has its functions interfered with later.

In this condition the nerve stretches as an exposed structure from its point of emergence low down on the facial ridge, across the cavity of the vestibule to its entry into the inner wall of the tympanum, corresponding to a point above and anterior to the original site of the oval window. (Fig. V.)

In knocking out the inner edge of the bony bridge, which corresponds to the upper inner wall of the tympanum, the stroke of the chisel should not be made from behind forward in a direction parallel to the course of the nerve, but from above downward, or, from before backward; i. e., in a direction perpendicular to the course of the nerve and to the Fallopian canal.

The reason for this is that the bone at this point tends to separate when struck from behind forward, along a plane of cleavage which crosses the Fallopian canal, causing its fracture; as the Fallopian canal at this point represents the greater portion of an exposed cylinder (Fig. I), its fracture results in the facial nerve being encompassed by a little annulus or cylinder of bone, which may be slid up and down upon the nerve, just as a ring upon a finger. This complication is—so far as the integrity of the nerve is concerned—a formidable one, and it requires the greatest patience to remove the little annulus without causing injury to the facial. To accomplish it we steady the annulus with mouse-tooth thumb forceps and with a pair of ronguers—the jaws of which are accurately apposed—crush it in a direction parallel to the course of the nerve.

To avoid this complication, it is only necessary before attempting the removal of the upper portion of the bony ridge that the Fallopian canal should have been thoroughly converted into a gutter, by shaving off its roof, as mentioned, and by making the stroke in the direction indicated. Should the accident now occur, the nerve can be easily freed from the little mass of bone by slipping it through the open side of the annulus, or cylinder.

Should we have to expose the nerve as mentioned and shown in Fig. V, no attempt should be made to retract it or draw it to one side for the sake of gaining room for manipulation, as this is unnecessary; for the Fallopian canal at the points at which the nerve emerges from and enters the bone is represented by sharp, serrated margins, against which if the nerve is drawn it may be lacerated at its fixed points. The sharp spicules should be removed so that the margins of the canal at these respective points is represented by an even rim.

The next step is to expose the antero-inferior cavity of the vestibule by removing the posterior aspect of the promontory and the outer vestibular wall. (Fig. VII.) We select a gouge, the width of which corresponds to the distance between the round and oval windows. The cutting edge straddles the little bridge of bone separating these two openings, and the stroke—which is slight, for the posterior aspect of the promontory is brittle and fractures easily—is directed

from above, downward and forward in the direction of the first cochlear turn. We must at this step think of the possible position of the dome of the jugular bulb.

The greatest care should be taken that the cutting edge of the chisel does not cross the cavity of the vestibule and impinge upon its inner wall, for the inner wall at this point bulges outward and is separated from the internal auditory meatus by a brittle partition of bone not more than 1-32 of an inch in thickness. (Fig. XVI.) Should the inner wall be fractured, we lose cerebro-spinal fluid and aside from the inconvenience caused by this accident, the infected operative cavity is placed in direct communication with the intracranial cavity and the patient's life is jeopardized; meningitis will probably result.

As the cerebro-spinal fluid is under pressure and is of low specific gravity, gauze does not act as an efficient plug to the rent; sterile wax is preferable.

By enlarging this opening, we secure, with the previous steps, the full exposure of the vestibular cavity and the beginning of the first cochlear whorl. Should we now find that the disease has invaded the cochlea, and this is the rule in the second class of cases, we must continue the exploration of the cochlea until we have followed the diseased process to its legitimate end.

We next remove the roof of the first cochlear whorl from behind forward, exposing its interior to a point just short of the carotid eminence. (Fig. V.) The instrument of preference is a thin, sharp gouge with no shoulder, the width of which is slightly greater than that of the cochlear whorl. Four structures are to be avoided; the dome of the jugular bulb below, the eminence of the carotid canal in front, the base of the modiolus and the internal auditory meatus internally. The danger to the first two is slight; to the second two it is imminent, and injury to these structures is to be avoided only with the exercise of care.

By confining the removal of the cochlear shell entirely to the roof of its first whorl and not allowing the gouge to impinge upon the inner wall of the cochlear turn these last dangers may be averted. From the carotid artery in front, the cavity of the first cochlear turn is separated by a hard cuff of bone which serves the purpose of an efficient bumper; though thin this partition is sufficient. (Fig. XII.)

If we now find that the limit of the disease has not been reached, we must explore the remaining cochlea. This constitutes by far the most difficult and dangerous step of the procedure; for the cochlea, which represents an extremely small cavity encased in a brittle shell of bone, is hemmed in on all sides by structures which we cannot afford to injure. In front is the carotid artery, below the dome of the jugular bulb, behind the internal auditory meatus, above and behind in immediate proximity to the second half of the first cochlear turn, the knee of the facial nerve. A circle a quarter of an inch in diameter could be so placed as to pass through the majority of these structures.

Were the above factors the only ones to be considered, it would be comparatively easy to select a point on the cochlear shell, which from dead house work we had found to be a safe one, and open its cavity. But the difficulty lies in the fact that within this shell of bone is contained a structure which from its position is exposed to injury, and which from a surgical standpoint is the most treacherous of the internal ear; I refer to the modiolus.

Before approaching the cochlea it will be well to consider certain anatomic features of the modiolus which are of surgical importance. The modiolus represents a small pyramid of bone seated upon the internal auditory meatus, decreasing in size from base to apex. Its apex is its weakest point, but the next weakest point is not immediately below its apex, but at the extreme base; for its base is excavated as shown in Fig. XI (Politzer), by the internal auditory meatus, and the pyramid consequently rests upon a mere rim of thin, brittle bone. If the chisel is applied to the pyramid well above its base and a stroke made, the fracture does not take place at the point of applied violence but at its base; when this occurs the pyramid fractures completely round the circumference of its base and separates as a single piece of bone. (Fig. XIV.) The internal auditory meatus is consequently opened throughout its entire circumference, and as the diameter of the base of the pyramid, or the rim of bone upon which it rests, is about 1-6 of an inch, the loss of cerebro-spinal fluid is rapid. The failure to appreciate the surgical importance of this anatomic feature of the modiolus resulted in the death of the first patient.

If we now examine the modiolus with a strong convex lens we see that the pyramid has an outer casing of brittle bone and a core which is porous, made so by canals running from base toward apex for the passage of various structures. These canals are not completely filled by the structures which they contain, and this permits the cerebro-spinal fluid to penetrate out into the modiolus.

During the second operation in which the modiolus had been removed well down toward its base it was noticed that a seepage of cerebro-spinal fluid took place through its stump; the intracranial cavity had been placed in gross communication with the infected cavity in an altogether unexpected way through the afore-mentioned channels, and the failure to appreciate the significance of this structural character of the modiolus resulted in the death of the second patient. In this case the infection could be traced along the cochlear branch of the auditory nerve. It now became important to determine how far down from the apex toward the base the pyramid could be removed without putting the intracranial and operative cavities in gross communication; for in dealing with the anterior half of the cochlear cavity it is absolutely necessary to get rid of a portion of the modiolus.

It can be shown upon increasing the tension of the intracranial fluid in a cadaver by injection, or in the living subject by pressure over the internal jugular vein, under which circumstances the cerebrospinal fluid will penetrate as far out as possible into the modiolus (i. e., grossly), that the pyramid may be removed from the apex toward its base, down to a point corresponding to the termination of the first cochlear whorl without causing the loss of cerebro-spinal fluid; i. e., without placing the operative and intracranial cavities in gross communication. As will be shown later, this suffices for the complete exploration of the anterior half of cochlear cavity.

In approaching, therefore, the cochlea, we must remove its shell in such a way as not to injure the modiolus. We select a point in the cochlear shell corresponding somewhat to the apex of the cochlear cavity, and with a thin, sharp gouge shave it down until the dark interior of a cochlear whorl shows through the thin lamella of bone. The stroke should be made from above downward and forward in a direction corresponding to that of a cochlear whorl.

Not infrequently the shell of the cochlea is scalloped and the position of the cochlear turns roughly indicated. In this way a window is created in the cochlear shell (Fig. X), and we now enlarge this window, completely exposing the upper portion of the cavity. (Fig. IX.).

In enlarging this window the small gouge is the instrument of preference; an attempt to insinuate a very fine curette beneath the opening in the cochlear shell causes its back to impinge or press upon the modiolus, which sticks up as a little tent pole in the cavity, and this may result in the fracture of the pyramid at its base. The gouge merely removes the shell without endangering the pyramid.

To expose the second half of the first cochlear whorl it is necessary to remove the apex of the pyramid down to a point corresponding to the termination of the first cochlear whorl, as shown in Fig. XII. This done, we can look down over the stump of the pyramid, upon the roof of the second half of the first whorl, which is indicated by the probe in Fig. XII, and with a small gouge carefully break through its roof from above, as shown in Fig. XIII, exposing in this way the entire interior of the cavity of the cochlea. In breaking through the roof over the last portion of the first whorl we are in direct relation to the facial nerve and the internal auditory meatus, both of which must be avoided.

The probe in Fig. XII, is wound round the base of the modiolus merely for the sake of illustrating the relations of the roof of the second half of the first whorl. An attempt to withdraw it may cause the modiolus to fracture; such a step, of course, would not be taken during actual operation.

In one instance I have had to exenterate the major part of the petrous portion of the temporal bone and the following points have impressed me:

That the petrous pyramid in this particular instance was pneumatic; we would expect to find such extensive involvement only in bones of pneumatic structure for reasons which are evident.

Where removal of the petrous pyramid is necessary it should first be exenterated; later the shell removed, otherwise the dura of the posterior and middle fossae bulge into the wound, constrict the operative field which is extremely deep, and close it to successful view. Retraction of these

structures is then necessary, but the best retractor is the shell of the petrous pyramid, as it commits no trauma, occupies no space, and is accurately applied to the surfaces to be supported.

A second reason for first exenterating the petrous is that the dura enclosing the superior petrosal sinus is firmly attached to the upper margin of the posterior aspect of the pyramid and separates with reluctance from this uneven lip. In consequence the vessel may be torn; sharp hemorrhage follows which is difficult to control, as it is not easy to place a compression plug between the dura and the bone, as the two do not readily separate. If the accident is to occur, it is more convenient that it should occur toward the end of the procedures.

We should attempt to save the facial nerve by preserving a bridge of bone extending from the lower portion of the facial ridge to the internal auditory meatus; with patience this may be accomplished and, in the instance mentioned, was accomplished. Even though the nerve be sacrificed, we should still attempt to preserve the bridge, the purpose being to give the dura of the middle fossa a seat upon which it may rest that it does not sag deep into the wound and become sealed in this position to the granulation bed springing from the floor.

When the dura is not supported it sinks and shuts off the apex of the operative cavity, rendering this portion difficult to handle, and it obstructs drainage. No amount of pressure by packing with gauze suffices to maintain it in a proper position, as the gauze soon becomes soaked and its supportive influence lost. Should, for any reason, reoperation be necessary—and we must remember that dyscrasias may underlie such extensive destruction, and portions of necrotic bone may remain which circumstances at the time of operation either cause to overlook or to abandon—the dura sealed in its vicious position constitutes an efficient barrier to further operative interference. For this reason the operation should be thorough and all dead bone in the deep, apical portion of the pyramid removed. When the bridge is sacrificed the nerve, which represents a curve, is exposed over a considerable portion of its length and it kinks and becomes enmeshed later in the granulation bed; this interferes with function.

It is dangerous to attempt to remove sclerotic portions of the pyramid with the rongeur. The force requisite for a bite of the forceps is great, the bone suddenly gives and the jaws of the rongeur spring together, sharp slivers of bone are thrown with violence against the tightly stretched dura of the cerebellum, which makes an excellent target to be perforated. I have seen the posterior fossa opened in this way.

It is highly important to be familiar not only with the surgical anatomy in the operative position, but to know the consistency of the bone; to know the result that will follow a stroke of the chisel when made in a definite direction; for the bone of the petrous pyramid is structurally treacherous, changing rapidly from pneumatic to sclerotic structure, which latter may crack, when struck, far beyond the point of applied violence and in a direction contrary to that expected. We can obtain a practical familiarity with this important part of the technic only by repeated work upon the cadaver, and an attempt at a description of this part of the technic is useless. Generally speaking, we should, when attempting to remove sclerotic portions of the labyrinth, make the stroke in the long axis of the cavity which the sclerotic bone covers. While this is not invariably true, it is as near as the facts can be reduced to rule.

In operations upon the labyrinth a point of interest is to be noted with reference to the carotid artery. When through erosion of the carotid canal the artery is exposed to view, there is, as a rule, no visible pulsation in the vessel; I have seen the artery exposed in eight cases (some in chronic sup-puration), and in only one instance was pulsation to be detected. If pressure is made upon the vessel with an applicator wound with cotton and the lumen of the vessel momentarily constricted, slight pulsation may be elicited. It is a wise provision that the vessel does not forcibly pulsate at this point and impinge upon the sharp serrated margin of the eroded canal, for the walls of the artery in the canal are thin owing to a lack of necessity for their full development.

The carotid canal serves a two-fold purpose: First, As the exposed artery in the canal shows no visible pulsation, or but a faint pulsation, it is evident that the carotid canal acts as a bumper to the pulse wave, receiving its impact and shielding the brain from excessive shock.

Second. As the canal is rigid and does not permit the artery to dilate except within narrow limits, it has the practical effect of constricting that portion of the artery within its grasp. The effect is the same as when with the fingers we constrict the lumen of a rubber tube through which water is being forced by a rubber bulb, i. e., there is a tendency under these conditions for the intermittent or remittent current to approximate a continuous stream. The carotid canal, therefore, not only protects the brain from excess of pulse impact, but it is a mechanism by which the inflow of blood to the brain is somewhat regulated and made more even and continuous. It is analogous to the hydraulic arrangement of the jugular bulb and sigmoid sinus on the venous side of the circulation, whereby an even outflow of blood from the brain is guaranteed.

During and following operation upon the labyrinth certain phenomena occur which are of exceeding interest.

If during anesthesia we produce intermittent pressure upon the capitulum of the stapes, we may in certain instances induce nystagmus, which—should it occur—would rather point to the fact that the labyrinth is functioning and not grossly involved in a destructive process. This experiment may prove of some value from a diagnostic standpoint in determining labyrinthine involvement, when the capsule shows no fistula.

If during operation we irritate with a probe the interior of the semicircular canals we may at time induce nystagmus. In the cases which I have seen the nystagmus has been bilateral and in the horizontal plane, regardless of which canal was irritated. The irritation of the inner vestibular wall gives a similar result.

The ampullary areas of the semicircular canals are more sensitive to irritation than their arches.

The upper posterior portion of the inner vestibular wall appears to be its most sensitive part.

A nystagmus which prior to operation is very marked may not disappear under ordinary surgical anesthesia until the semicircular canals are removed and the vestibule opened, when it may entirely cease.

If the horizontal semicircular canal is by accident injured as during the acute mastoid operation, vertigo, vomiting, and

nystagmus may appear and may be marked; again, these symptoms may be entirely wanting. As a rule, the disturbances which follow the injury are exceedingly slight and ephemeral, and consist of horizontal nystagmus—most marked when the eyes are directed to the opposite side—and slight vertigo with tendency on the part of the patient to fall away from the labyrinthine lesion. Profound disturbance of hearing, as a rule, follows.

If the operation has encroached to any extent upon a functioning labyrinth, particularly in cases where both the canal system and the vestibule are removed, disturbed equilibrium, nystagmus, and vomiting, which is accompanied by nausea, as a rule, follow. The vertigo is more pronounced when an attempt is made to assume the sitting posture, and closure of the eyes augments the disturbed equilibrium. The patient, as a rule, tends to fall to the side opposite the labyrinthine lesion.

At first the nystagmus may be of marked rotary character—the globes rotate beneath the closed lids, and nystagmus is independent of an attempt to fix the eyes upon an object. Nystagmus may be present in whatever direction the eyes assume. In a few days a marked decrease occurs, and as a rule, though not always, the greatest excursion of the globes is in the horizontal plane. At first the oscillatory movements may be fine; later they are coarse, sluggish and jerky. The apparent fineness or coarseness of the movement appears to be dependent upon the rapidity of oscillation. The nystagmus as a rule, presents the following features:

1st. It is most marked when the patient looks to either the extreme right or left lateral position.

2d. When the eyes are directed to the upper vertical meridian, slight nystagmus may be observed, which, at first may appear vertical in direction, but upon careful inspection a slight rotary movement will be seen. This latter is possibly due to the action of the extrinsic muscles of the eye.

3d. When the eyes are directed to the lower vertical meridian, the nystagmus is slightest, and, as a rule, absent, even though present in other meridians.

4th. The nystagmus is most marked when the eyes are directed to the extreme lateral position of the normal side. Even after the nystagmus has totally disappeared in all other

meridians, it may still be made manifest when the eyes are turned from the labyrinthine lesion. Occasionally the patient tends to fall to the side of the labyrinthine lesion and not to the opposite side. When this occurs, the nystagmus may be most marked when the eyes are directed to the extreme lateral position of the operated side, or equally as marked as when turned to the normal side. There appears to be some harmony, as to direction, in which disturbed equilibrium and nystagmus are most manifest.

The vertigo and vomiting which follow operation upon the labyrinth, cease, as a rule, in a few days, and disturbed equilibrium and nystagmus soon subside. The patient, however, when attempting to walk a straight line, may show for some weeks or months subsequent to operation a tendency to deviate from the involved side; he may so tend to fall immediately after operation. In other cases all disturbances of equilibrium disappear in a few days. This tendency to fall or to deviate from the side of the labyrinthine lesion occurs in cases in which the horizontal canal alone is removed, in which the canal system and vestibule are both removed, or in which the entire labyrinth is removed. In some cases a slight nystagmus may be observed months after the operation; it may persist for years.

In some instances where the nystagmus is not of sufficient degree to be manifest when the eyes are directed to infinity, it may be made so by having the patient suddenly converge and accommodate, though this is not the rule.

The primary direction of the oscillatory movements is away from the labyrinthine lesion, i. e., if the left labyrinth is involved the direction of oscillation is from left to right, or vice versa, no matter in what direction the eyes are turned; I have seen no exception to this.

The nystagmus and vertigo as above described are in no sense characteristic of the labyrinth; I have seen the same phenomena occur in cerebellar abscess, the location of which was in immediate proximity to its central lobe.

Upon the removal of the semicircular canal system, the vestibule, and the lower half turn of the first cochlear whorl, I have seen nystagmus, vomiting, vertigo, disturbed equilibrium, and intense high-pitched hissing noise, which were distressing before operation, immediately cease.

As to why the destruction of the semicircular canal system and vestibule may in the one instance be productive of vertigo, vomiting, nystagmus and disturbed equilibrium, and in the other cause these same symptoms to quickly disappear, I do not know, but even where these symptoms follow operation upon the labyrinth and are marked, they, as a rule, so quickly subside that it is evident first, that the semicircular canal system is not an indispensable factor to the preservation of equilibrium; and second, that we can scarcely attach to it the importance of being the central organ of the statical sense, as its loss can be so quickly compensated for and in some instances seems to produce no disturbance whatever; it evidently is a part of more or less importance in the great circuit governing equilibrium, but it is by no means an indispensable part, nor is the entire labyrinth indispensable.

Following the removal of the major portion of the labyrinth, conjugate deviation of the eyes may occur, the direction assumed being upward and outward toward the operated side, as if the eyes were attempting to see the labyrinthine lesion. It should be mentioned, however, that in the two cases in which the phenomenon was observed, cerebro-spinal fluid was lost in both. This suggests that the conjugate deviation may have arisen from other causes than the destruction of the labyrinth. The conjugate deviation was noticed immediately upon the patient's emergence from anesthesia.

Following the removal of the deep portion of the petrous pyramid, we may notice upon the patient's emergence from anesthesia that both pupils are dilated ad maximum. This dilation probably results from disturbance of the sympathetic, at the deep, apical portion of the pyramid.

The pupils, though dilated ad maximum, may react to both accommodation and to light. The dilation gradually disappears after several weeks.

Following the exenteration of the petrous portion of the temporal bone, probing or pressure in the immediate vicinity of the stump of the auditory nerve may produce vertigo, nystagmus, and the subjective phenomenon of intense noise, which noise is referred to in the involved ear. The trunk of the auditory nerve is capable of interpreting mechanical stimuli, as sound, and from the case which I had the oppor-

tunity to observe, I am inclined to believe that the trunk of the auditory nerve is also sensitive to waves of sound.

Following the exenteration of the labyrinth, the patient may be exceedingly sensitive to noise and to loud musical sounds. The sense of harmony may be lost and after several months regained. The patient, if subjected shortly after operation to loud musical sounds, as the playing of the piano, may become intensely d'zzy, the vertigo attaining to such a degree that it necessitates his sitting that he does not fall.

It would appear that we receive through the auditory apparatus certain physical impressions which, when transmitted to higher centers, act as supporting influences to the preservation of station; that these, when not balanced by similar impressions acting upon the other ear cause, so to speak, an auditory imbalance; that the disturbance is due to the lateralization chiefly to one side of those impressions, which give rise to the subjective phenomenon of sound is questionable, inasmuch as the patient who was totally deaf before operation experienced then no such disturbance under similar conditions.

The phenomenon is suggestive of the great variety of factors which may act through the medium of the auditory apparatus and contribute to the preservation of that condition which we speak of as the state of equilibrium—it gives us an insight into the intricacy of the function of the auditory apparatus.

Following the removal of the entire labyrinth, tinnitus may still persist in the involved ear; its character, however, may completely change, and in all the cases the tendency has been—even where the tinnitus before operation was intense and of high pitch—for it to assume a low, buzzing, inoffensive character after operation. Later the tinnitus may entirely cease.

When the facial nerve is exposed throughout its entire circumference, we may with confidence look for paralysis upon the patient's emergence from anesthesia. The paralysis deepens and in forty-eight hours becomes complete. It persists from four to five months, even though no injury is done the nerve other than its exposure to the wound and its fluids, and though the reactions of degeneration may appear, the face under massage, and with time, regains its

nearly normal expression; I have seen, however, no case in which the function has been so completely restored that the variation in the two sides could not be detected upon the act of smiling. When the nerve is exposed in the manner mentioned, it is difficult at the time of operation to make it respond to ordinary mechanical stimulation, and moderate heat does not affect it.

The facial nerve is structurally very delicate. I have seen a nerve after several days' exposure to an infected cavity which had been irrigated but twice with a 1-10,000 solution of bichlorid of mercury, quickly disintegrate and completely disappear. The nerve should be protected by sterile vaseline and subjected to no pressure by the packing, and the dressing should be changed sufficiently often to keep the cavity clear of pus.

Subsequent to operation, meningitis may occur. It manifests itself in from forty-eight to seventy-two hours. It is characterized by the usual features, with the exception that the sensorium is remarkably clear till near the end; the termination is rapid. Though the postmortem may show a diffuse leptomeningitis, the cerebellar fossa is the site of greatest pathological activity. The route of invasion may be apparent, and in one of my own cases was along the course of the auditory nerve.

When the internal auditory meatus is opened, the rapidity of escape of cerebro-spinal fluid suggests the proximity to the canal of large quantities of cerebro-spinal fluid, as if the cerebellar fossa contained or was in direct communication with a relatively great amount. In the period of approximately a minute, the cavity represented by the Staeker-Schwartz excavation may fill as many as three times.

Following the too rapid drainage of the cerebro-spinal fluid from the cerebellar fossa the following symptoms may appear: a small, rapid, irregular pulse; embarrassed respiration, which may assume a Cheyne-Stokes character; an anxious, concerned expression, with cold extremities and pinched, livid features; marked restlessness.

These symptoms may be of such alarming character that death seems imminent, but with a lessening of the escape of cerebro-spinal fluid the whole picture may in the course of a few hours so completely change that the patient appears

quite normal. These symptoms are undoubtedly due to a too rapid drainage of the water-bed of the brain, whereby the important nerve centres at the base, having lost their elastic support, sink and are brought into undue contact with the floor of the skull.

The quick disappearance of these symptoms upon the cessation of the escape of cerebro-spinal fluid forbids any other than a mechanical interpretation.

Following operations upon the labyrinth, large quantities of sugar and acetone may appear in the urine, and the clinical picture of diabetes may rapidly develop. These phenomena suggest that operation upon the labyrinth may be productive of a profound systemic shock which does not manifest itself in the usual disturbances of temperament and pulse. The causative relation, however, between shock and diabetes is highly suggestive of the major character of the labyrinthine operation.

In three cases where the major portion of the entire labyrinth was removed, including the semicircular canal system, there appeared to be after a lapse of over two years in the first, one year in the second, and nine months in the third, no sign whatever of muscular atrophy of either side of the body.

Where the destructive process in the labyrinth has existed for a long time and the irritative stage is passed, the organ, so to speak, is functionally silenced and shows no sign of life; its exenteration is followed by no disturbance whatever of equilibrium; no vomiting, vertigo, or nystagmus occur, as the compensating factors, whatever these may be, have made good the deficiency.

That the disturbance of equilibrium, nystagmus, etc., which follow the removal of portions of the labyrinth are due, to some extent, to the loss of these parts is highly probable, inasmuch as these symptoms continue, even though the interior of the labyrinth is thoroughly cocaineized. That these symptoms, however, are not altogether due to the loss of these parts is evident, inasmuch as under anesthesia, mechanical irritation of the interior of the vestibule may produce nystagmus, as may also pressure upon the ampullary areas of the semicircular canals. Pressure upon the stapes may give a similar result. Further, if we irritate with a probe certain

portions of the labyrinth subsequent to operation, we may in some instances cause the patient to fall, by producing an intense vertigo. Nystagmus may also be induced or augmented by pressure over certain areas. It is highly probable, therefore, that the disturbances of equilibrium which follow the removal of portions of the labyrinth are due not only to the loss of the parts destroyed but also to peripheral irritation, to which the interior of the labyrinth is subjected. It is only upon this double basis that we can explain certain phenomena in connection with these cases.

For instance, in case X of the writer's series, disturbed equilibrium, vertigo, vomiting and nystagmus which were intense and distressing before the operation, immediately ceased upon the removal of the semicircular canal system, the vestibule and the lower half of the first cochlear whorl. If, therefore, these disturbances are due to the non-activity of the canal system, and not to irritation, why should the patient when in possession of these parts have exhibited intense disturbances of equilibrium, and after their removal, which insured their non-activity, have shown no disturbances of equilibrium whatever?

Following operation upon the labyrinth, the pulse may be both irregular and rapid and this disturbance may be independent of the loss of cerebrospinal or labyrinthine fluid; the condition soon rights itself.

From the following facts certain conclusions may be drawn, which are of some practical interest in that they show the difficulties attending labyrinthine localization. If we remove the arch of the horizontal semicircular canal, there may follow, vertigo, vomiting, nystagmus and disturbed hearing.

The removal of the entire canal system and the vestibule may be followed by the same phenomena.

The accidental removal of the stapes may produce vertigo, vomiting, nystagmus, disturbed equilibrium and disturbed hearing. The destruction of portions of the vestibule and cochlea without destruction of the canal system produces the same phenomena. It is now evident that if we deny to these various phenomena, representing several different functions disturbed, the entire labyrinth as the anatomic seat of each (for these phenomena follow no matter what portion of the labyrinth is destroyed) we are led to the following conclusions, which seem to be supported by clinical evidence:

1st. That if the integrity of the labyrinth is encroached upon at any point, the function of hearing, as well as the non-acoustic functions, is seriously interfered with.

(If the encroachment has been gradual and there is no apparent disturbance of equilibrium, etc., it is due to compensation.)

2d. That the disturbances which follow the destruction of a given portion of the labyrinth are not necessarily to be attributed to the loss of the parts destroyed.

3d. That the destruction of the labyrinth at a given point affects the function of distant parts as well. If, for instance, we destroy the entire labyrinth with the exception of the cochlea, or, if we merely remove the arch of the horizontal semicircular canal, we are at a loss to know whether to attribute many of the disturbances which follow to the loss of the parts destroyed or to the irritation of the parts remaining.

It therefore follows that an attempt at labyrinthine localization based upon symptoms will always be subject to the grossest error, and that the attempt to determine the functions of the various parts of the labyrinth by the experimental destruction of these will be subject to the same error.

The difficulty of experimentally determining with accuracy the functions of the various parts of the labyrinth with a view to labyrinthine localization, and this is here alluded to merely on account of its surgical interest, is due in large measure to the anatomical arrangement of the labyrinth, the essential feature of which is, that it is suspended in a fluid medium which is *continuous*. A disturbance of the medium at any point is transmitted throughout the entire apparatus and results in the disturbance of distant parts.

While this particular anatomical arrangement complicates the study of the physiology of the labyrinth, it is an essential attribute of an organ which embraces several distinct and separate functions which are correlated, in that each is influenced through the same common medium and to some extent by the same primary cause—waves of sound.

The labyrinth is an example illustrating the conservation of energy in the evolution of an organ, in that the anatomical bases of its several functions, which in reality represent different organs, should have been so grouped together and

suspended in a common medium as to make common use of that medium. This arrangement is evidence of the influence which waves of sound exert upon the non-acoustic as well as upon the acoustic labyrinth and a practical example of this is illustrated by the case previously mentioned where the patient when subjected to loud musical sounds, after the exenteration of the entire labyrinth, was made so dizzy as to necessitate his sitting, his equilibrium having been profoundly disturbed.

While it is the purpose of the present paper to treat of only those conditions which have a surgical bearing, there are many facts in connection with the cases which are of interest in that they are in contradiction to certain theories which have gained a more or less widespread acceptance.



FIG. 1.

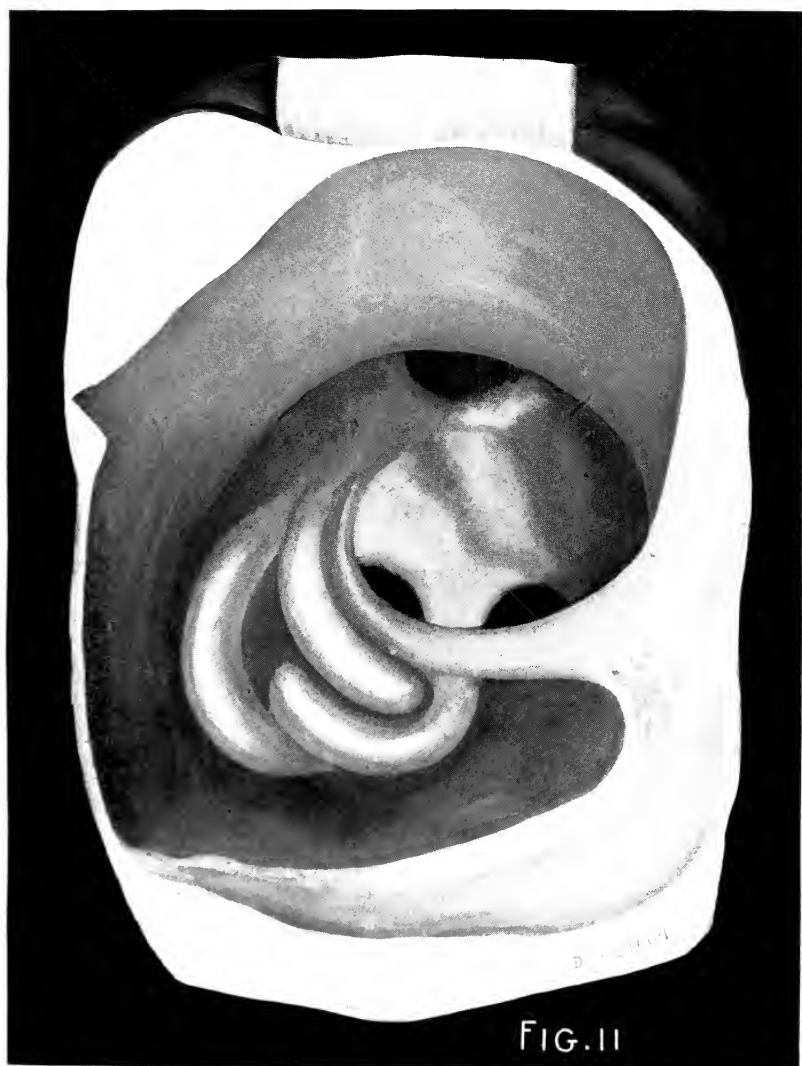


FIG. II



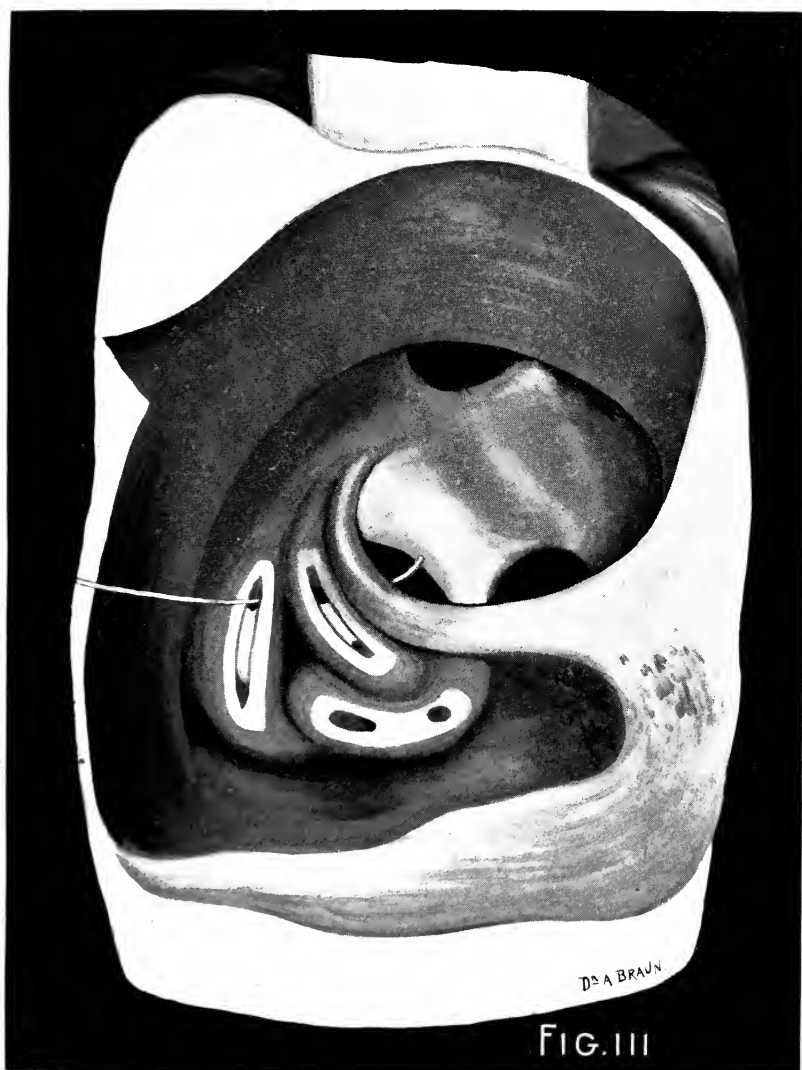
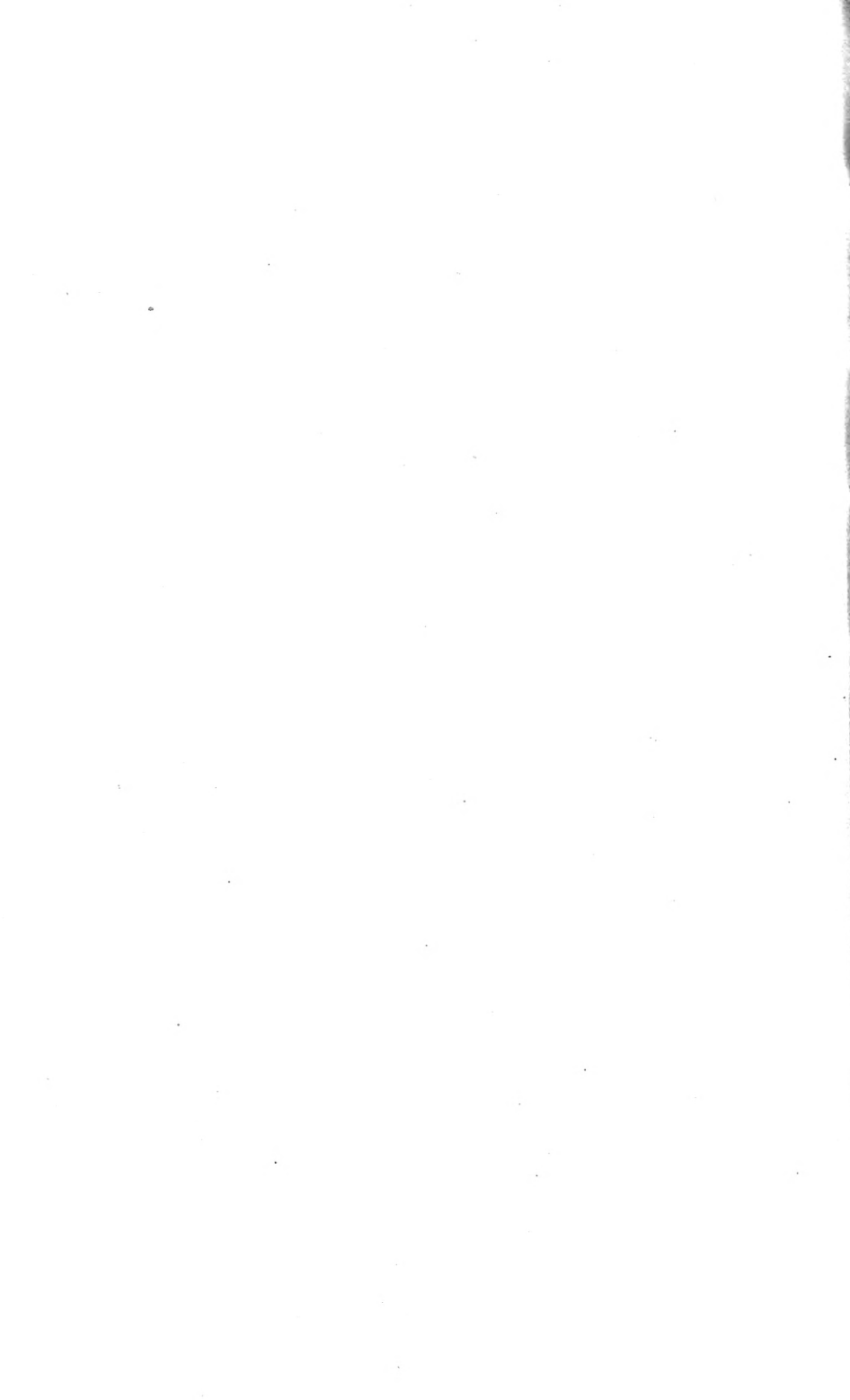


FIG. III



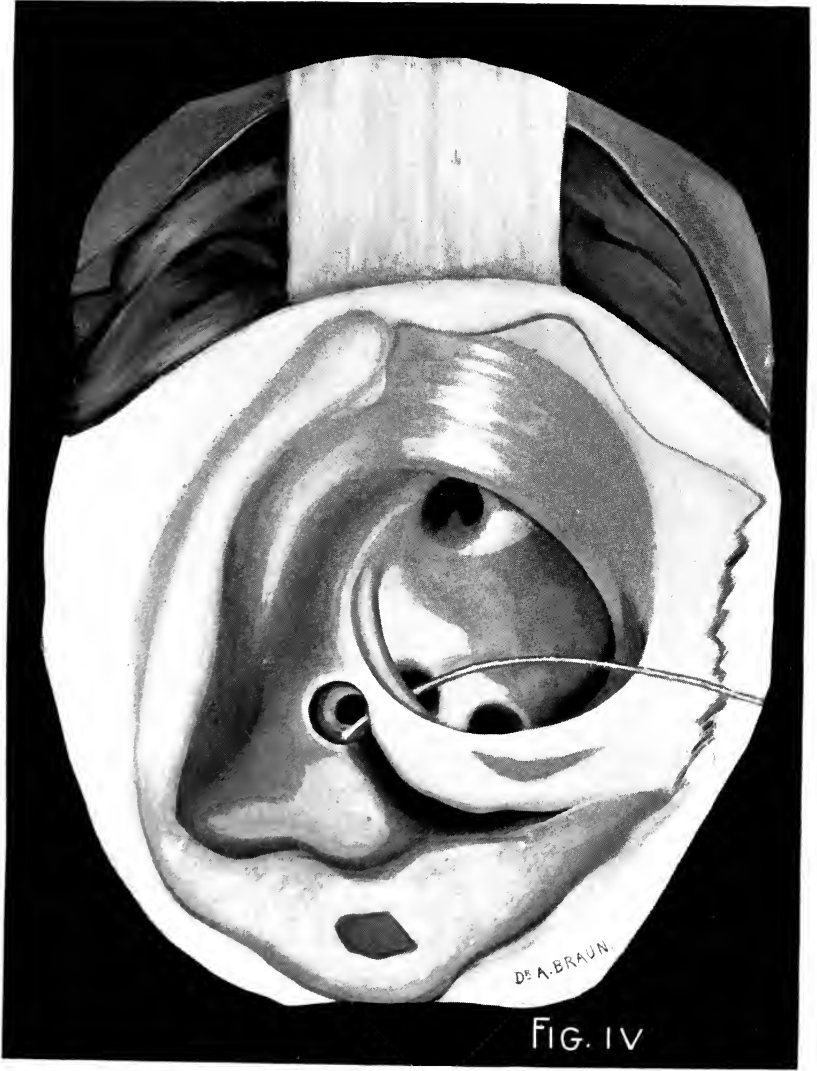


FIG. IV





FIG. V





FIG. VI.



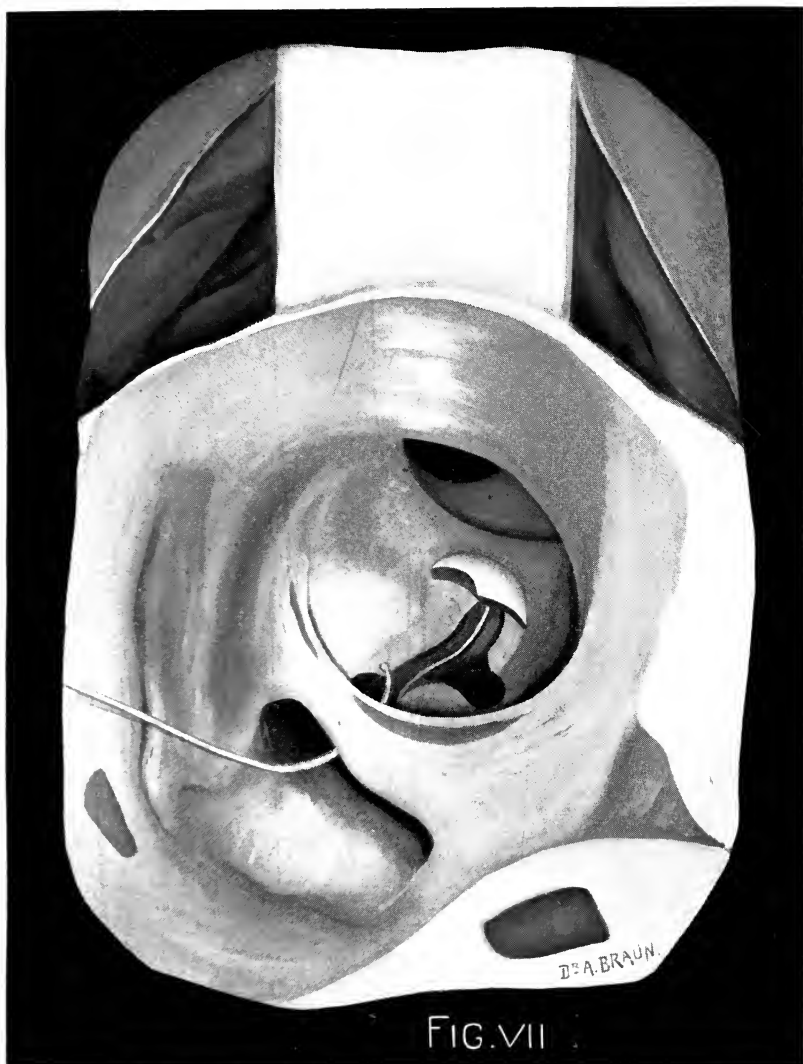


FIG.VII



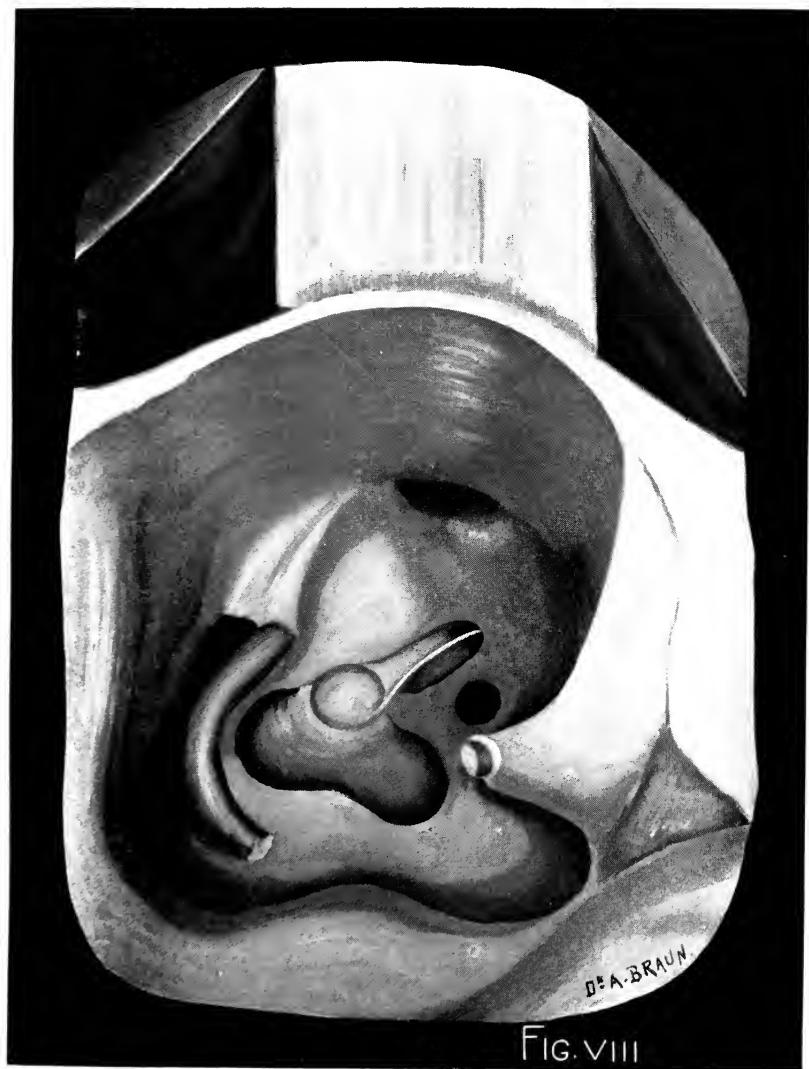


FIG. VIII

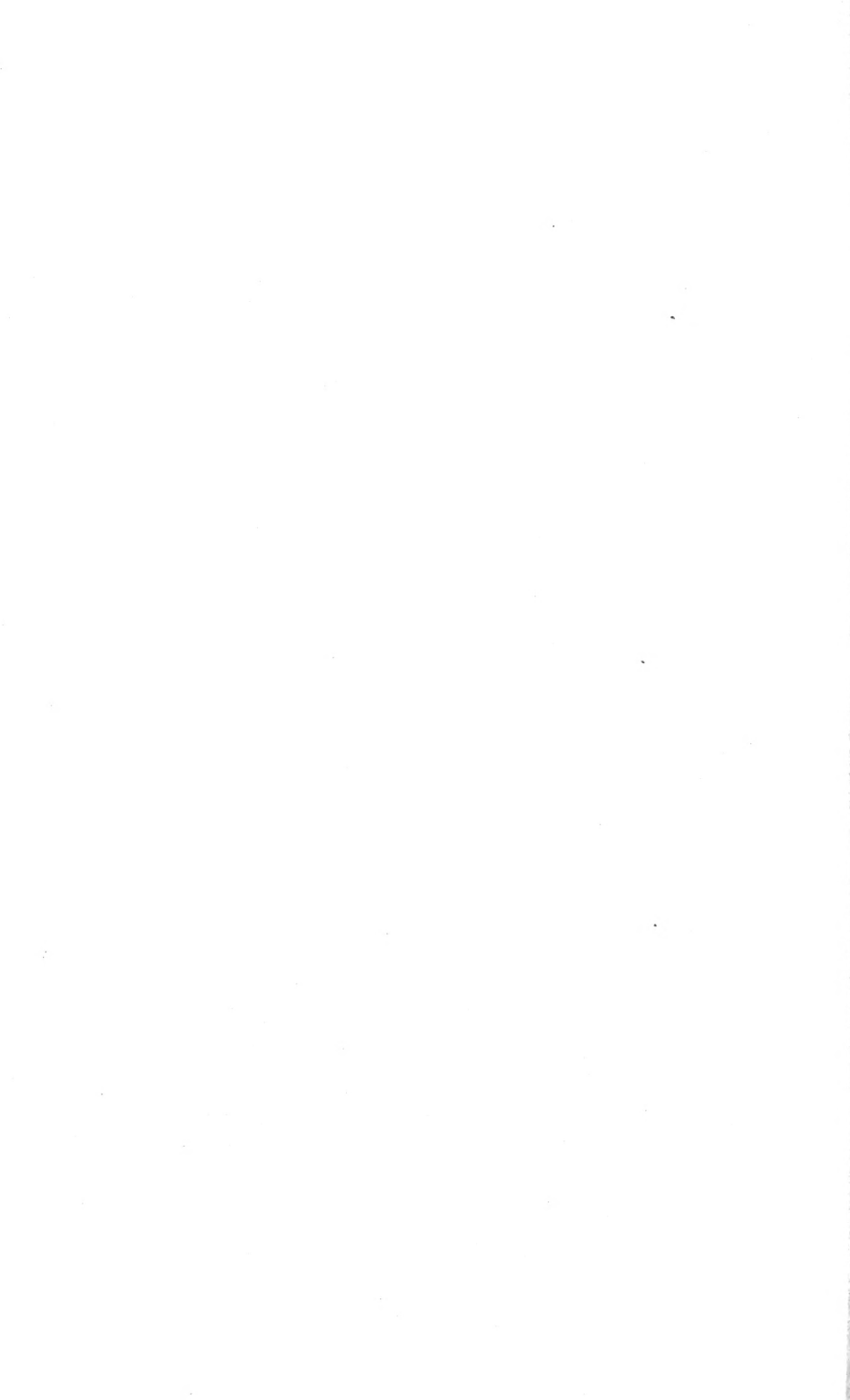




FIG. IX



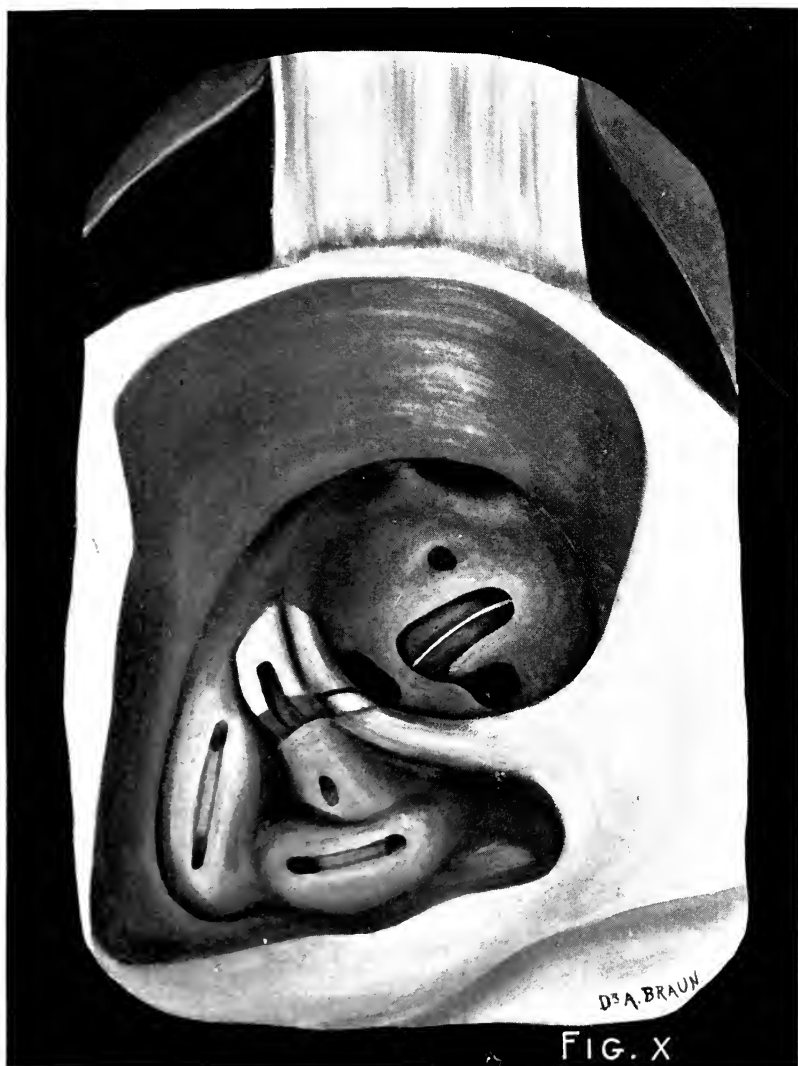


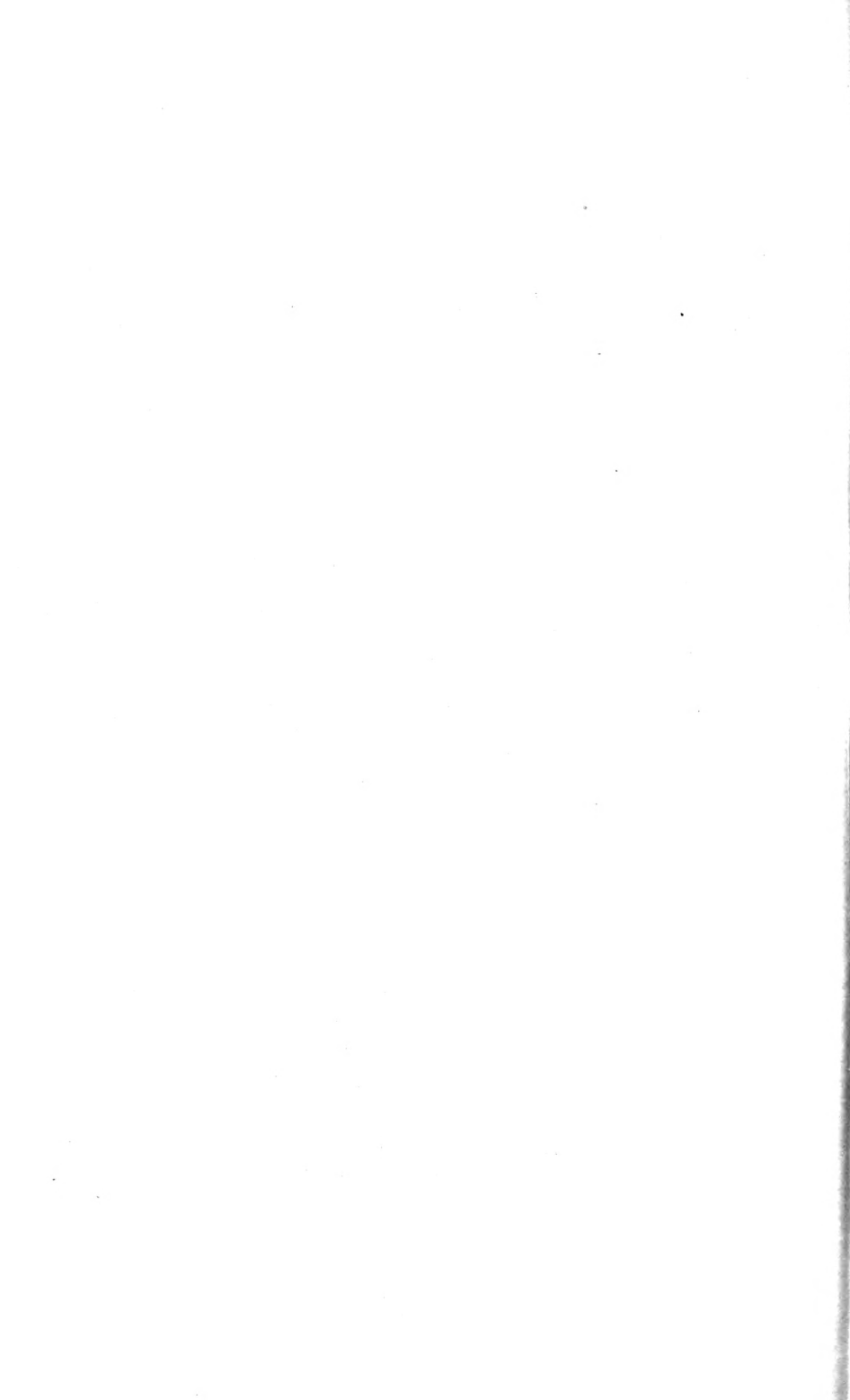




FIG. XI



FIG. XII



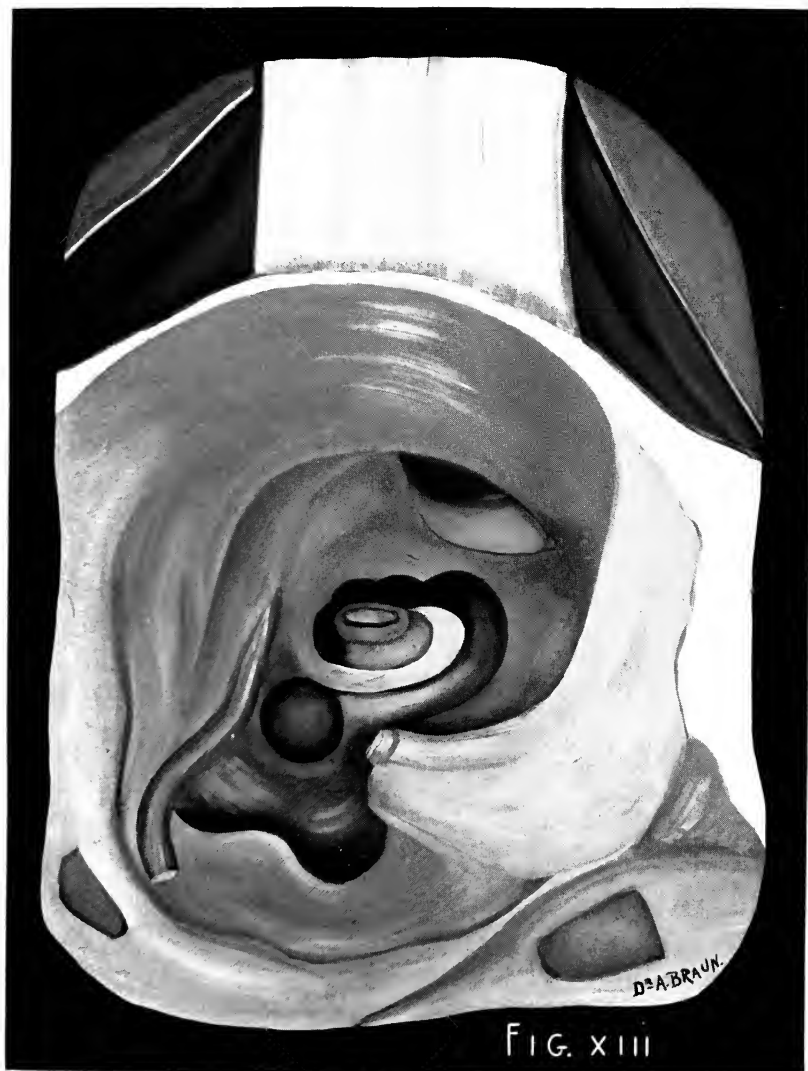


FIG. XIII











XLII.

THE SUPPURATING MIDDLE EAR DISEASES OF INFANCY AND CHILDHOOD.*

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It is a familiar fact that a completely developed organ is less liable to disease than a growing one with its proliferation of cellular elements and abundant blood supply. Being one of those regions of the human body, immature at birth, possessing a developmental stage extending through the early years of life, reaching maturity in many instances only with the advent of puberty, the juvenile ear possesses inherent elements which readily make it a field for disease.

Searching through literature one finds, in contradistinction to adults where symptomatology and diagnosis preceded pathology, in children the richness of autopsy material caused many pathologic facts to be uncovered long before diagnosis exercised during the patient's life appreciated their existence. This is to be understood when the difficulties attending even the cursory examination of the child are taken into account. Furthermore, the absence of subjective or functional examinations, because of what must be apparent—their absolute impracticability in many instances—classes the suppurative ear diseases of infancy and childhood among those whose fatal termination often alone bring evidence of their having existed; and where not fatal, whose sequelae in handicapping the later man or woman in their after career, by varying degrees of deafness, best point the gravity of their attack.

Hence, the study of the suppurative ear diseases of childhood, to place this work of competent clinical observers and laboratory workers together, in such form that a better under-

*Read at the Thirteenth Annual Meeting of the American Laryngological, Rhinological and Otological Society, May 30, 1907.

standing of this prevalent condition may result.* I have busied myself with this study for some time, and in the following, where deemed advisable, I have added personal cases, and also the results of anatomic studies wherever data thus obtained conflicted with or emphasized the writings of others.

I have limited myself to middle ear suppurations, merely touching upon some of the sequelae, because even at that the limits of this paper have gone beyond my original intentions.

We are indebted to Gruber¹, to Haug² and to Gomperz³, among others, for suggesting the possibility and feasibility of examining the external auditory canal and the drum in even the youngest child, so that today, at least, the attempt at such examination is usually made, where formerly diagnosis in these cases rested on facts obtained per exclusion. I believe from personal experience that in at least 80 per cent of all children a view of the membrana tympana is obtainable.

I.—PREVALENCE.

A glance at the published statistics will convince one of the prevalence of this condition. Thus, after examining 22,894 school children in the city of Zurich, Laubi⁴ found that 14 per cent of all children under 4 years of age were affected, the most frequent anomaly being some form of tubal trouble.

The frequency with which various pathologic conditions were demonstrable was as follows:

Tubal trouble.....	51.1 per cent.
Remains of Otitis Media Purulenta....	16.2 per cent.
Internal Ear Involvement.....	14.4 per cent.
Cerumen.	6.5 per cent.
Otitis Media Catarrhalis Chronica....	5.4 per cent.
Otitis Media Purulenta Chronica	2.4 per cent.

Barschmann⁵ examined children to determine the hearing faculty, with the following results; he divided his cases into five groups, viz:

First group could not distinguish acumeter or voice beyond five meters.

Result for acumeter.....	3.0 per cent.
Result for voice.	2.3 per cent.

*I have not attempted to quote the entire literature, limiting myself as far as possible to those whom I have been able to find as the original reporters on the given point, or where controversial questions would seem to require authoritative substantiation. Cumulative authority has been eliminated as far as possible, hence many well known names will be found omitted.

Second group could not hear acumeter beyond 6-8 meters—
5.5 per cent.

Second group could not hear voice beyond 6-8 meters—
3.8 per cent.

Third group could not hear acumeter beyond 9-10 meters—
6.6 per cent.

Third group could not hear voice beyond 9-10 meters—
5.4 per cent.

Fourth group could not hear acumeter beyond 11-15 meters
—9 per cent.

Fourth group could not hear voice beyond 11-15 meters—
21.8 per cent.

Fifth group had normal hearing.

Of those examined, he found that as age increased larger numbers were hard of hearing. His results further demonstrated pathologic changes in drum and external auditory canal in 3 per cent of the cases; scars in the drum were present 14.4 per cent; the retracted drum was evident in 14.2 per cent, while 5.3 per cent showed perforated drums, some having, and others having had aural discharge. He found the defectiveness of hearing in direct proportion to the demonstrable pathologic changes present.

In order to estimate the frequency of occurrence of middle ear suppuration as compared with adults, it is only necessary to glance at the reports of Burkner and Bezold and at my own findings.

Of all Burkner's⁶ patients with ear suppurations (both acute and chronic), 36 per cent were adults and 64 per cent children. Bezold,⁷ on the other hand, reports of his patients that 20 per cent were children and 80 per cent were adults. The difference in these two reports lies in the fact that Burkner's report is restricted to suppurative conditions, while Bezold's refers to all ear diseases.

Through the courtesy of my chief, Dr. Wendell C. Phillips, I instituted an examination of the records of our clinic at the Manhattan Eye, Ear and Throat Hospital, New York City, and find that, for the last seven years and two months, there were in all 7,300 cases of ear disease recorded. Of these, 2,116 were children ranging in age from a few days to 18 years. That is, of all the cases treated, 28 per cent were children.

The following are the tabulated result and percentage of

frequency of the diseases found to have existed in the children at the time they applied to the clinic for treatment:

Diseases.	Number of Cases.	Percentage of Frequency.
Otitis Media Purulenta Acuta.....	710	33
Otitis Media Purulenta Chronica.....	696	32
Otitis Media Catarrhalis Chronica.....	281	13
Mastoiditis	97	4
Furunculosis	25	1
Deafmutism	27	1
Labyrinthine trouble	5	0.2
Cerumen	137	6
Sundries	128	6

From this table it is apparent that 69 per cent of all the children applying for treatment suffered from middle ear supuration, the mastoid being involved at the time of admission to the clinic about 4 per cent of times. During the first year of life Barth⁸ places the percentage of all children having otitis media as high as 80 per cent, his observation being based on the results obtained from 600 cases and autopsies.

Furthermore, in material coming to autopsy from children whose death had been ascribed to various causes, the post-mortem examination demonstrates that the ear is diseased oftener than is suspected. Thus Ponfick⁹ found in 100 autopsies, where death had been ascribed to various causes, that only nine cases evidenced normal ears. These cases were from the Breslau Klinik, with ages varying from one day to four years. His results showed both ears involved 78 times, and unilateral involvement 13 times. He reports that his post mortems demonstrated, aside from a moderate enlargement of the spleen, that the ear alone showed pathologic changes, and he concludes that otitis media may occur as an independent infectious disease capable of causing death.

Not only are many children affected, but many of the ear diseases of adult life date their origin to the early days of life. Of 100 cases of chronic middle ear suppuration among adults, Barbarin¹⁰ found that 42 were traceable to the days of infancy or childhood. I found about 27 per cent of the adult cases giving histories which lead me to hold that the ear troubles were the sequelae of an active process during the early formative period of the ear's development.

II. CAUSES OF PREVALENCY.

Having established their prevalence, what are the causes underlying the suppurative middle ear diseases of infancy and childhood which tend to produce this prevalency?

These underlying factors may be classified as follows:

1. General constitutional disease, and the hereditary influence of tuberculosis and syphilis.
2. The prevalence of the exanthemata during childhood.
3. Anatomic structures peculiar to childhood in the ear and its adnexa.

1. Regarding the general diseases whose presence in childhood predisposes toward the prevalence of otitis media, it may be said that any general disease which tends to weaken body resistance lays the child liable to ear disease. Among such must be recognized rachitis, bronchopneumonia and the gastrointestinal derangements. (Rasch⁷⁹, Kassel⁸⁰, Hartman⁸¹.)

Regarding the latter, I differentiate between gastrointestinal disturbances per se, and those bowel and stomach derangements produced by otitis media, of which I will speak later.

Furthermore, a child afflicted with tuberculosis or syphilis is very apt to develop a middle ear disease, which may or may not be of itself tubercular or syphilitic in its pathologic findings. Thus Henrici⁸² concludes that one-fifth of all cases of infantile mastoiditis is due to tuberculosis, and although Barbarin¹⁰ does not believe tuberculosis responsible for the many cases of infantile otitis media, still he reports 10 per cent of 100 cases of chronic suppuratives presenting tuberculous caries. Haike¹¹, also noting its existence, believes its extension is from the pharynx through the Eustachian tube, in contradistinction to the views held by Henrici, who believes the circulation responsible for its presence in the ear.

But it is especially of tuberculosis or syphilis in the parents to which I allude as being distinctly of moment when considering the causes underlying the prevalency of ear diseases in childhood. Körner¹² holds that one of the predisposing factors is tuberculosis or syphilis in the parents, the children themselves not necessarily being either tuberculous or syphilitic, especially holding it of importance when advanced tuberculosis is present in the father at the time of procreation. In this connection, it is of interest to note the report of Ostman¹³, who, basing his results upon the examination of school children in Marburg (Germany), determined that those families

which included the relatively highest numbers of children with hardness of hearing, likewise presented the relatively most frequent taint of tuberculous heredity.

I have observed, in taking histories of under-developed children, with recurrent swellings of the cervical glands, that their parents while often not admitting being tuberculous, at least give signs by their general appearance which would lead to a suspicion of its presence,—a suspicion which unfortunately cannot be proved. Again, it has been my experience that these cases, when operated upon, and with no mistakes as to technic, still do not get well, and I have always felt that the constitutional tuberculous taint, which I suspected but could not prove, was the cause of the trouble.

2. The exanthemata, contagious as is their nature, attacking many children and bringing in their train the involvement of the ears in many cases, are thus in themselves important factors influencing the prevalency of ear disease in childhood.

Downie's report, cited by Holt¹⁴, shows 501 cases of middle ear suppuration following the exanthemata; he reports that measles preceded the ear disease in 26 per cent, scarlet fever in 12 per cent and whooping cough in 15 per cent of the cases. Bezold¹⁵ and Jansen¹⁶ estimate that 5-10 per cent of all ear disease are due to scarlet fever, and at least from 12-28 per cent of all purulent ears are its sequelae according to Haug¹⁷. Heubner¹⁸ studying 393 cases reported 27.4 per cent ear complications (scarlatina), and Burchardt-Merian¹⁹, describing an epidemic of scarlatina, observed the ear involved in from 22 to 33 per cent.

It is to be noted in passing, that among the initial symptoms of scarlatina, there is presented a swelling of the adenoid tissue of the pharynx.

While formerly it was held that measles did not affect the ears as readily as does scarlatina, more recently it has been demonstrated that ear complications follow measles almost as often as it does scarlatina. Wendt²⁰ places ear complication following variola as high as 98 per cent, but it must be borne in mind that this disease is not very prevalent with us, and hence plays a small role as a factor determining prevalency of ear suppurations in childhood.

Epidemic influenza, mumps, and pneumonia complete our list of diseases rather prevalent in childhood, whose evil sequelae are presented in the form of ear complications.

3. Among the anatomic structures peculiar to infancy and childhood which are factors tending to cause prevalence of ear disease at this age, we find that the lymphatic ring of Waldeyer takes an important place, and of this lymphatic ring the adenoid is of greatest importance.

The adenoid of childhood is in itself not to be considered as an etiologic factor. On the other hand its diseased condition is:

The adenoid tissue in the child's nasopharynx is in my opinion a normal physiologic growth. The peculiarities of the infant's Eustachian tube will be reverted to later. At this time, I wish merely to allude to its shortness of length, its widely open lumen, and its horizontal direction. Bearing these things in mind, it has always seemed to me, aside from whatever other physiologic function the adenoid may have to perform in the body economy, that nature used the adenoid to block the wide open pharyngeal orifice of the infant's Eustachian tube, separating the adenoid from the tube opening during the act of swallowing, thus causing a similar ventilation as in the adult where the lumen of the tube, usually collapsed, opens during the act of swallowing because of the action of the pharyngeal muscles. In the child were it not for this physiologic growth, the tube would be open constantly.

Furthermore, it is known that with the advance of years, as the temporal bone takes on more and more the adult type, the Eustachian tube becomes in course of growth longer, and more vertical in direction, its lumen becomes smaller, until its sides are in contact; and at this time—in the normal, healthy child—the adenoid, remaining normal, atrophies until it practically disappears; its physiologic function as a block to the tube no longer being necessary.

With these things in mind, I hold the adenoid not an etiologic factor in the ear disease of childhood, unless it is pathologically involved; but believe it rather a protection afforded the ear to keep food particles, etc., from lodging in the tube. It is a familiar experience to have children, whose ears had at some previous time suppurated, give evidence of a succession of ear attacks after adenoid removal. In this connection it may not be amiss to pause in the ruthless removal of adenoids, until satisfied that this growth is really a pathologic factor in the ear disease, or is in itself giving symptoms which demand its removal.

The recurrence of the adenoid, for I hold it to recur, many opinions to the contrary notwithstanding, is a fact which I have seen, and I believe with Görke¹² that it will recur, the regeneration depending upon the continued activity of the identical factors inducing increased functional capacity and an increased production of lymphocytes. It is interesting in this connection to hear Barth²² report that of his material, aging about 1 year, only 29-30 per cent of 202 patients having adenoids presented middle ear disease, and Kerley²³, reporting from his private practice 51 cases of otitis media suppurativa acuta, found adenoid vegetation present in only 6 cases.*

This must not be construed as a protest against the removal of adenoid vegetation from the nasopharynx where such is hypertrophied, and presents itself as an impediment to nasal respiration. A little experience in the examination of the pharyngeal cavities of normal children who have well developed nasal bridges, and whose appearance show none of the stigmata of the mouth breather, will serve to teach the amount of adenoid in the normal child.

Furthermore, referring to what I said under general diseases, especially tuberculosis and syphilis, the report of Brieger and Görke²¹ becomes more important. They studied the difference between the hypertrophied faucial tonsil and hereditary constitutional anomalies, such as scrofulosis, tuberculosis and syphilis, and the so-called lymphatic constitution and infectious diseases. They point out that in a number of cases the clinical picture of tonsillar enlargement is due to the tuberculosis, and that syphilitic processes occasionally simulate hyperplasia, and that the latter may occur as a side manifestation of hyperplastic processes in the lymphatics of the pharynx.

Furthermore, Lartigue and Nicoll²⁴ made examinations of 75 consecutive specimens of adenoids regarding tuberculosis, and concluded that tuberculosis of the adenoid is probably more frequent than supposed. They found 16 per cent of their series containing the tubercle bacilli, and 10 per cent giving characteristic lesions of tuberculosis.

Therefore I draw the conclusion that enlarged tonsils and

*Regarding frequency of adenoids among the school population of New York, Chappell found their existence in 3 per cent of 2,000 children; other observers, as reported by Lartigue and Nicoll²⁴ find them among children as follows: Rosenberg 97 per cent; Wroblewski 7 per cent; Schmiegelow 5 per cent.

adenoids and the ear suppurations are both due to the underlying constitutional condition, and this condition and not one of its manifestations (the adenoid) is the real factor of moment, and the attempt to influence the ear in such cases by removing the adenoid (a manifestation of the constitutional condition) is bound to be unsuccessful.

On the other hand, when the adenoid is diseased, and in every condition causing an inflammation of the mucous membrane of the pharynx—rhinitis, coryza, etc.—and in the initial stages of the exanthemata, producing as they do first inflammation and then hyperplasia and hypertrophy, then the adenoid becomes a menace to the health of the ear. Nor do I think Mackenzie's statement an overestimate, when he says that the discovery of the adenoid has probably saved nearly 100,000 individuals from deafness.

Regarding its presence in cases of disturbances of hearing, Abeles reports it as 57 per cent, while Halber places it at 47 per cent (cited by Goppert²⁵).

Having discussed the anatomic peculiarities of the lymphatic tissue of the pharynx, the anatomic peculiarities of the juvenile ear present factors which are inherently of etiologic moment, not only as tending to account for the prevalency, but also as being more or less directly causative factors in the suppurative ear diseases of infancy and childhood. These factors may be briefly summarized as follows:

1. Characteristic features of the juvenile Eustachian tube.
2. Peculiar behavior of the petrosal pyramid during the developmental period.
3. Characteristics of the juvenile tympanic cavity and its contents.

To understand these three factors intelligently, I briefly present the anatomy of the infant's and child's organ of hearing. This we find divided according to its physiology into a sound perceiving and a sound conducting portion. Thus there is an external, middle and internal ear, the external and the middle relating to sound conduction, the internal to sound perception.

To the external ear are counted the external auditory canal and concha; to the middle, the drum, ossicles, the tympanum and its correlated cavities, leading into and including the mastoid cells on the one hand, and the opening into and including

the Eustachian tube on the other. These all constitute the sound conducting apparatus.

To the internal ear, whose physiologic function is sound perception and recognition, are counted the entire auditory nerve system, from its center in the brain to its endings in the labyrinth, the cochlea, ampullae and semicircular canals constituting the labyrinth.

The most characteristic feature of the Eustachian tube in the young is its shortness; according to Eitelberg²⁶ its length is 19mm, and Schengelidze²⁷ places it as 22 mm—in contradistinction to that of adults, which Politzer estimates at 34-36 mm. A further characteristic of the tube is its horizontal plane of direction, while in the adult it inclines away from the horizontal. Its lumen is wider, and the examinations of Schengelidze demonstrated that the lumen constantly grew smaller as the child increases in age. Its tympanic orifice is placed at a higher level than it is found to have in the adult, while at its pharyngeal end the protuberance so well marked in adult life is never prominent in childhood. These characteristics of the tube have already been alluded to in the discussion of the adenoid in childhood.

Fabricinab Aquapendente²⁸, and the older writers already were cognizant of the fact that different conditions prevailed in the tympanum of the infant and child from that to be found among adults. This refers more to the contents than to the bony wall of the cavity. They held that the tympanum was filled with mucus or phlegm or a reddish fluid. (Linke²⁹).

Following the researches of v. Tröltsch³⁰, one of the first to point out the embryonal character of the tissue filling the tympanum, others among whom Wendt³¹, Boke³², Weiss³³, Kutscharianz³⁴, and more recently Preysing³⁵ and Gomperz³⁶, are noted, although differing as to histologic details, in the main substantiated the fact that the contents of this cavity in early infancy are of an embryonal character.

Gomperz's conclusion based upon 50 autopsies in older children, while establishing the existence of a cavity as such, still finds remains of embryonal tissue, especially at the maleo-incudial articulation.

Without entering into the discussion as to the histologic details, suffice it to say that this embryonal tissue because of its retrogressive change, easily furnishes the soil for the propagation of invading microorganisms, and thus the character

of the tympanic contents in the young constitute a factor in the etiology of the suppurations of the middle ear in childhood.

The upper wall of the tympanum (tegmen tympani) presents in the very young a fissure (the petro-squamosal) situated between the petrous and the squamous bones, extending backward as far as the mastoid antrum. It is traversed by a process of dura which establishes communication between the lining of the tympanum and the cranial cavities. This dural process carries five branches of the middle meningeal artery for distribution along the upper wall of the tympanic cavity. This fissure closes at about the fifth month of ossification, until later in life, the child presents only the remains of this fissure as the petro-squamosal suture. As a route by which infection may travel from the tympanum toward the cranial cavity, this fissure and its resultant suture become of importance.

There is another route for intracranial invasion in the young. This is the subarcuate hiatus, an orifice opening from the temporal bone into the cranial cavity, about 4 mm. in width, situated immediately under and to the side of the upper semicircular canal, almost at the edge of the petrosal section of the bone. In adults, only a scanty remnant of this hiatus remains.

The lower wall or floor of the tympanum is a thin bony partition covering the jugular bulb. In the young it is a thin, transparent plate. I have often found the mucous membrane of the tympanum in direct contact with the bulb, the intervening plate of bone either totally absent, or having distinct defects. (In 25 specimens examined in special regard to this point, I found the plate partially or wholly absent 4 times in 10 specimens, ranging from birth to 3 years, and 5 times in all the specimens, ranging in age from birth to 14 years.) Urbantschitsch³⁷ holds this as more or less of a common occurrence under five years of age, and Bryant³⁸ calls attention to the possibility of puncturing the jugular bulb during paracentesis through this thin bony partition, Dench³⁹ and Gruber⁴⁰ citing cases of such accidents.

The other walls of the tympanum present nothing characteristic of the young. The external wall, the drum, will be referred to below.

In size the tympanum does not materially differ from the adult. (Bryant³⁸.)

Regarding the rudimentary mastoid process, it is found at early age situated close behind and somewhat over the external auditory canal, gradually shifting its position to the rear of the external auditory meatus, and is fully developed only about puberty.

The mastoid cells develop individually different characteristics in different children. Many claim absence of cells in the child's mastoid, but the total absence of pneumatic cells together with the preponderance of diploic, cavernous spaces is to be regarded as a sort of disturbance of development (Körner⁴¹). The newly born, according to Körner, present a fully developed antrum but no mastoid process proper, the existence being indicated by a protuberance. In this observer's opinion the mastoid cells' development progresses from the antrum, at first backward, later on toward the protuberance, until at the end of the first year pneumatic cells are apparent and begin to develop. At the third year the mastoid may already closely resemble the adult type, and I recently had occasion to operate upon a female child (2 years) whose mastoid presented no deviation at all from the adult type, being not only extensive in area, and fully developed, but having mastoid cells throughout.

In two of my dissections, one made on a specimen of 1½ years, the other at about 2 years, I was able to demonstrate an anterior and posterior grouping around a central plate of bone. I find that Barbarin⁴² cites Schwartze and Eysell as describing such grouping and an intervening plate, with a posterior inferior group of cells concealed below and behind the antrum. He states that this plate lies in the course of the petro-squamosal suture. I fail to substantiate this claim from the meager material so far at hand.

The external wall of the tympanum is made up of the membrana tympani. This differs but slightly from the adult, regarding size, but its form is slightly more oval. Its position changes gradually as the child ages. Generally speaking, it is almost horizontal at birth, and takes upon itself a more vertical position as age advances.

Many observers hold that the infantile drum is of greater thickness and density than that of the adult, and to this anatomic feature these observers lay the fact that otitis media in children runs its course occasionally without producing perforation, but I believe that the consistency of the drum in

the child is as variable as we find it among adults, and I have as often found it, delicate, thin, and translucent in the one class of patients as in the other. The ossicles present nothing characteristic of the young.

From the drum, the external auditory canal connects the internal parts with the external ear or concha.

This canal is at birth only a ring of bone, continued to the concha by soft parts. This ring of bone develops, becoming a broader segment as age increases, until between the third and the sixth year, it takes on adult characteristics.

Often more than I supposed (I found it 4 times in 10 adults' bones and almost one-fourth of all children's bones examined), there remain defects in the ossification of the external auditory canal, and these are of importance, because occasionally they are the point at which pus will break through from suppuration of glandular tissue in this vicinity, which exuding at the meatus simulates a purulent otorrhea. I had such a case under treatment last winter, where the child (male 4 years) was sent to me for treatment of a persistent purulent otorrhea, which had followed an attack of mumps. The glands in the neighboring regions were still swollen, and the external auditory canal was filled with pus, its walls being excoriated. Only after careful cleansing and inspection was the fistulous opening in the lower anterior portion of the external auditory canal, noted, about $\frac{1}{3}$ of its length inward. When a small probe entered this opening, and further inspection demonstrated a normal drum, the diagnosis was clear. A counter opening over the swollen gland, followed by appropriate treatment cured the case.

Of the external auditory canal, it may be stated that its walls are almost in apposition in the very young, and that the lumen widens as the child becomes older. Its roof boundary is the external surface of the skull (*superficies meatus*).

Symington⁴³, in an exhaustive study of the meatus of childhood gives the length of the canal for the various ages as follows:

Age.	Floor.	Roof.
2 mos.	17 mm.	13 mm.
6 mos.	19 mm.	14 mm.
1 yr.	20 mm.	15 mm.
2 yrs.	22 mm.	16 mm.
5 yrs.	23 mm.	17 mm.
6 yrs.	24 mm.	17 mm.

Studying this table, the angle of inclination of the drum to the horizontal axis of the canal is outlined.

Finally, it is to be noted of the squama, as a characteristic of the young, that it is bent upon itself, forming an angle. This not only becomes of importance in the surgery of this region in the young, for this bent plate overlies the aditus, but from the direction of this superficies meatus and the direction which it gives to the external auditory canal, it causes the concha attachment to the underlying bony parts to lie at a relatively higher level than the level of the tympanic membrane, a fact to which I recently called attention⁴⁴, and which is in contradistinction to the condition obtaining in the adult.

The concha, while not fully developed as regards size, is relatively typical of the adult in other particulars and the labyrinth, fully grown and developed at birth, both as regards form and size, presents no special characteristic of early age.

Before closing this section, I must refer to the defects noted by many observers (Körner and others) in the bony canal incasing the facial. These defects lay the contained nerve open to attacks by the purulent contents of a diseased temporal bone, with resultant early paralytic phenomena. The point of emergence of the nerve from the skull (stylo-mastoid foramen) is very superficial, to which fact I will revert later when discussing surgery.

Finally, summing up the factors which make up the anatomic peculiarities of the infant's and child's temporal bone, which are etiologically important, and as such one of the causes for the prevalency of suppurative middle ear diseases, we find:

1. The anatomic characteristic of the petrosa with its contained auditory apparatus, behaves while in the developmental period differently from what it does in adults. (Baginsky⁴⁵.)

2. The characteristics of the tympanum, its freer communication with the nasopharynx and cranial cavity, together with the retrogressive changes in its lining membrane and contents.

3. The frequency of dehiscences and abnormalities. These constitute the anatomic factors underlying the frequency of middle ear suppuration in childhood.

III. PATHOLOGY.

It is impossible, when speaking of the factors producing prevalence of ear suppurations in childhood, not to bring out the pathologic factors, for these two are interwoven, and while the factors already discussed may be regarded as remote causes for the disease, the immediate cause is to be found in the invading pathogenic organisms.

The development of the pathologic study of suppurative conditions of the middle ear of childhood is largely the work of Zaufal⁴⁶, Netter⁴⁷, Weichselbaum⁴⁸, Gradenigo⁴⁹ and Penzo⁴⁹, Brieger⁵⁰ and Preysing⁵¹.

Many microorganisms are to be found in causal relationship to the condition; the streptococcus pyogenes, the pneumococcus, the staphylococcus pyogenes, the pseudo-influenza bacillus (Kossel⁵²), Fraenkel's pneumo-bacillus, Friedlander's bacillus, the bacillus pyocyaneus, the tubercle bacillus (Habermann⁵³), the gonococcus (Flesch⁵⁴) and the Vincent's bacillus and spirillum (Held⁵⁵) are among those met with.

Gomperz³⁶ is authority for the statement that the virulence of many bacteria is reduced in the tympanic cavity. Regarding the order of frequency with which particular organisms are found in the middle ear, a divergence of opinion exists. Weiss⁵⁶ found the diplococcus pneumoniae in 42 per cent of cases, the streptococcus pyogenes in 39 per cent, the staphylococcus albus in 27 per cent, the staphylococcus aureus in 12 per cent of his cases; on the other hand, Preysing studying 121 infected ears found the pneumococcus infection ranging as high as 92 per cent. Reading Preysing's results with the observations of Schengelidze⁵⁷—who making 90 autopsies found pneumonia accompanied by otitis in 91.6 per cent of the cases, we are of the opinion that the pneumococcus is the most frequent invading organism in the middle ear of the child. Furthermore, regarding the invading organism, I recall the old theory of Zaufal, that primary otitis always results from a pneumococcus infection, while secondary involvements of the ear almost invariably belong to the streptococcus infections.

The relative rarity of the staphylococcus is to be ascribed to the fact that the tympanic infection usually is an acute process, and in acute processes one rarely finds staphylococci.

In passing, let me note that the coincidence of otitis and

pneumonia was commented on as early as 1864 (Streckheisen⁵⁸), and 1868 (Wreden), and recently Gomperz, in 1906, holds the common cause of both pneumonia and otitis to be the grippe infection.

Having thus briefly sketched the offending organisms we will next consider the route of invasion.

In the child this is usually through the Eustachian tube. When the protective arrangements of this tube, the open door to the middle ear, are paralyzed, the disease and its causative agent travels by contiguity to the tympanum, and there, by reason of the character of the tissues, which undergoing retrogressive changes furnish a ready soil for germ propagation—the microorganisms take hold, and produce their malignant effects, whose results are classified as purulent otitis media.

IV. CLINICAL PICTURE.

The clinical picture of the onset of a typical case of middle ear suppuration is usually sudden, with or without demonstrable cause, or coincidental with general systemic disturbances. There may be headache, languor or lassitude, and more or less pain on the affected side. Very often both ears are affected simultaneously although to varying degrees. Fever, and in children old enough to have it determined, an interference with hearing is obtained, proportionate to the degree of inflammation present. Rigidity of the neck is sometimes noted. This is the clinical picture in older children.

But in the young infant and child, where headache cannot be expressed, and where pain remains unlocalized, the question of the clinical picture becomes more difficult.

Generally speaking, every child exhibiting uneasiness, fever, and symptoms of intracranial irritation should be examined as to its ears, unless some distinct pathologic condition is present to account for the symptoms.

Even the early writers, among them Schwartz⁵⁹ (1825), Meissner⁶⁰ (1828), Helfft⁶¹ (1847), and Hauner⁶² (1863), without the aid of otoscopic examinations, pointed out the frequency with which children's ears were affected and the ease with which such conditions might be overlooked.

Vomiting, somnolence, uneasiness, delirium and coma were the grave symptoms which the ear disease brought in its train, these all subsiding with the advent of the otorrhea. Even v. Tröltsch, believing an otoscopic examination almost im-

possible, made his diagnosis by exclusion. His construction of the clinical picture as cited by Gomperz is worthy of repetition.

Uneasiness, restless sleep, interrupted at intervals by wakeful periods, the child rolling its head about on the pillow or boring into it, with an occasional characteristic cry of pain, this cry repeating itself at the least jostling or shaking—these constitute a clinical picture whose recognition is easy to the observer of today.

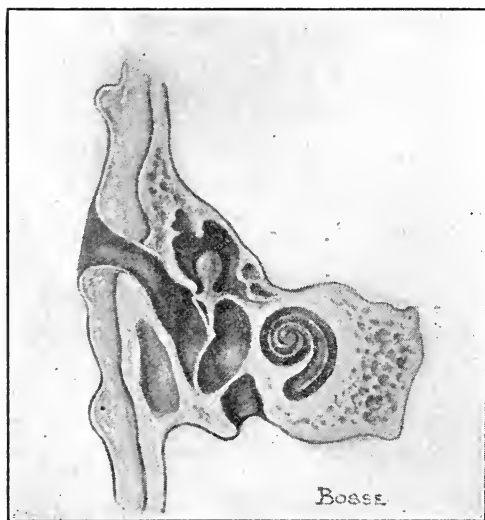


Fig. 1. Fronto-vertical section through the external auditory canal, the drum and the pyramid of a year old child, showing the direction of the canal, its attachment to the superficies meatus, and the nearness of the middle ear to the surface of the skull. The thin wall of bone separating the tympanic cavity from the jugular bulb is also indicated. (Drawing partly schematic, after Gomperz.)

To touch the affected ear produces cries of pain. There are frequent remissions, the pauses lasting from hours to days. The loss of appetite is, however, constant. The act of swallowing may cause pain (v. Tröltsch, Gomperz). I have observed a nursing infant attempt to suck and after repeated trials let the nipple go and start to cry. Gomperz saw the same thing, and further reports that when fed with a spoon the child under his observation took the nourishment.

In very young infants, gastrointestinal disturbances manifest themselves, due to the absorption of toxins from the tympanic cavity, and the stools soon increase in frequency, accompanied or not with vomiting. Following the gastrointestinal derangements, there is loss of weight (Hartman⁶³), (Schengelidze⁶⁴).

Goppert⁶⁵ held the vomiting to be due to hyperemia of the dura and partly due to irritation of the labyrinth, and Gompertz (l. c.) holds this symptom as the first signal requiring an answer in the form of a paracentesis.

If the condition remains unrelieved, the fever continues high (if patient is more than one month old) and finally after the development of antrum empyema, or mastoiditis, cerebral symptoms come on, followed by coma and finally death.

It must be remembered that bowels and lungs may be implicated either coincidentally or prior to, or as a resultant involvement from the ear disease, and in any of such cases the difficulty is multiplied when attempting to analyze the clinical picture and to differentiate the general from the local disease.

To take up a mooted point: Regarding intestinal disturbances, it is a fact that many observers have seen these, coincident to ear disease (also personal observations); but while some have held the bowel derangements and vomiting as causative of the ear trouble (Goppert⁶⁶), others hold that the bowel derangements were the result of the ear trouble. Preysing, Ponfick⁶⁷, Hartman⁶⁸ and Jacobi⁶⁹ believe both views have foundations on fact.

Preysing's conclusions seem to me the most trustworthy. He holds the diarrhea to be a kind of septic diarrhea, and recalls to our minds the fact that the pneumococcus, which is the most frequently offending microorganism, belongs to that class of streptococci which are the causal agents of sepsis, it having been demonstrated that streptococci toxins cause diarrhea and also ecchymosis of serous membrane. (Homer and Laitinen⁷⁰).

Whatever may be the cause of the gastrointestinal disturbances, it remains a fact that one often sees the onset and termination of the disease of the ear with the onset and termination of bowel derangement, and I hold with Gompertz that any one who has observed this will be impressed with the fact that a direct effect is produced by ear disease upon the entire body, the bowel troubles being a manifestation of this systemic effect.

It is noteworthy in this connection that of the material reported, a large majority of the children found to be suffering from middle ear suppurations at autopsy were undeveloped, marasmic, atrophic and undernourished.

I have observed cases where the nourishment of the children suffered, and where there seemed to be general malnutrition, anemia, and generally a feeling of non well-being, in cases wherein the attending physician could not locate the disturb-

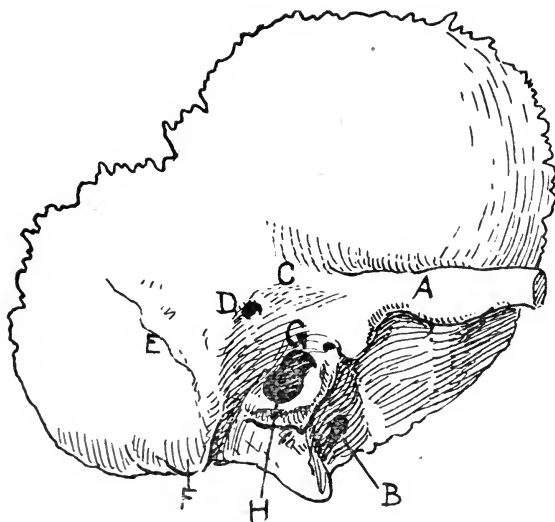


Fig. 2. Outline drawing of the temporal bone of a two and one-half year old child, showing landmarks. A—Zygomatic process. B—A defect in the ossification of the anterior inferior bony wall of the external auditory canal. C—Supramastoid crest. D—Point of election for entering the antrum. E—Squamo-mastoid suture. F—Rudimentary mastoid process. G—Superficies meatus. H—Osseous opening of the external auditory canal.

ing factor, and the otoscopic examination demonstrated only a thickened drum; these cases remained obscure until an examination of the pharynx evidenced a purulent exudate coming from the Eustachian tube. (One case, a girl 3 years of age, and two male children aged 2 and 3 years respectively, in one of which, the younger, purulent exudate also came from the nostril on the affected side.)

Finally, the advent of otorrhea. In younger children otor-

rhea does not present itself early. This has been held to be due to greater thickness of the child's drum. (Jacobi and others.) I do not believe that the thickness of the drum plays any important role. But the wide open tube, affording partial drainage toward the pharynx saves the drum from early perforation, and thus the ear disease may be present for some time, the deleterious products of the suppuration being absorbed and swallowed to the detriment of the child's health before the presence of otorrhea points the way to the diagnosis by the attending physician.

To summarize:

When a child, without demonstrable cause, while under usual diet, begins to run fever, is restless, rolls its head, and refuses to drink, meanwhile giving evidence of bowel derangement with consequent loss of weight, unless the clinical picture points in a definite pathologic direction, then the ears should be subjected to rigid examination to determine their condition. Among older children, the localization of pain and persistence of fever, with negative results from general examination, points to ear involvement.

Finally, because a pathologic process in the ears of young children may be present for a longer period than the obtainable history would suggest, it results, that many cases already have the elements of chronicity when discovered, bone necrosis already at this time having begun.

V. COURSE.

The course of middle ear suppuration in childhood is dependent upon the causal facts influenced by the patient's age and inherent powers of resistance, the latter a result in a great measure of inherited tendencies.

The duration of suppuration lasts from days to weeks. I have seen purulent cases, with bacteria demonstrated, entirely dry, perforation closed within a week from onset. Regarding duration we can safely say that the earlier the child receives rational treatment the earlier the cure, excepting such cases where the constitutional taint of tuberculosis or syphilis plays a role.

It must be noted however that many cases linger along in spite of treatment, and in many of these there is usually to be found enlarged faucial tonsils; in others, the children belong to the undernourished type, or they present the above mentioned constitutional stigmata.

VI. OTOSCOPIC EXAMINATION.

I have endeavored so fully to draw the clinical picture that there remains but to call attention to the otoscopic examination, and the question of diagnosis is settled.

I believe the otoscopic examination, if carefully performed, will always give valuable additional data, and hold that in

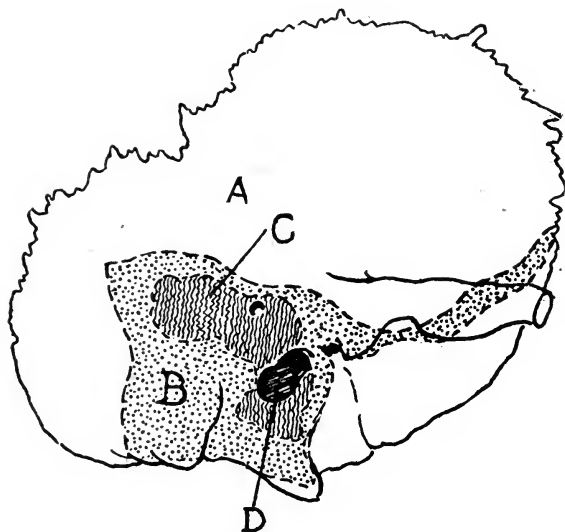


Fig. 3. Outline of the three year old temporal bone, with shaded portion showing as cut in Fig. 7, on the external surface of the skull. A—Outline of the temporal bone. B—The line through which the section was made to expose C—The middle ear and antrum on the external surface of the skull. (Drawing from author's specimen.)

80 per cent of all children, and 100 per cent of all children above one year's age, an otoscopic picture is obtainable.

To aid in procuring this, I have had constructed a speculum, Figs. 9 and 10, shaped like a truncated cone, its sides concave; whose smaller end is finished off at an angle of 45 degrees. This allows of a wider field of vision for the same thickness of speculum, than would be obtainable were this end cut straight.

For illumination, we have an incandescent light attached, so that children can be examined in bed, or in arms, without re-

liance on reflected light. And to any one who has attempted to examine a struggling infant, this little instrument will appeal as a distinct advantage.*

The drum pictures differ in no way from the findings in adults, except that all pictures are seen foreshortened, because of the great incline toward the horizontal which the child's drum presents.

VII. COMPLICATIONS.

Besides the complications, general in nature, which the middle ear suppuration in childhood present, we have periosteal abscesses, mastoid antrum empyemata, and mastoid process involvements, brain abscesses, suppurations of the labyrinth, and sinus phlebitis.

To discuss these in detail is beyond the scope of this work, but I will briefly note some characteristics peculiar to childhood.

Periosteal abscess develops rather easily in childhood, because of the exceeding thinness of the external wall of the antrum. Gomperz finds the swellings presenting themselves more often above than behind the ear, in contradistinction to the position assumed in adults.

Empyemata of the mastoid process very often give few if any distinctive symptoms in early life and are easily overlooked, while in the acute empyemata of the mastoid antrum, they characteristically present (not always however) a rather profuse otorrhea with a slight sanguineous tinge. The discharge is demonstrably coming away under pressure. Occasionally, the soft canal wall is separated from its bony parts by the extravasation of pus; and in one case seen by the writer, the drum remaining intact, the drum and soft canal became everted like the turned in end of a glove finger, this presenting at the external auditory meatus, like a new growth.

Following free incision and removal of pus, with replacement of everted part of canal, healing resulted.

Swelling of the gland at the angle of the jaw in a case presenting a particularly fetid otorrhea, is occasionally the only symptom pointing to mastoid involvement in those with a constitutional stigma, or in ill-nourished marasmic children.

The external auditory canal usually narrows because of inflammatory swelling of its walls, presenting superficial ulcer-

*Instrument made by the Wappler Electric Controller Company of New York City.

ation from excoriations by the pus. I place more reliance on this narrowing of the canal, than the sinking of the posterior superior quadrant, as the former, in my experience, is the better guide in childhood.

Facial paralysis, coming on early, while it may presage great involvement of the mastoid, is not reliable, for the frequently occurring defects in its bony casing easily lay the exposed nerve open to attack.

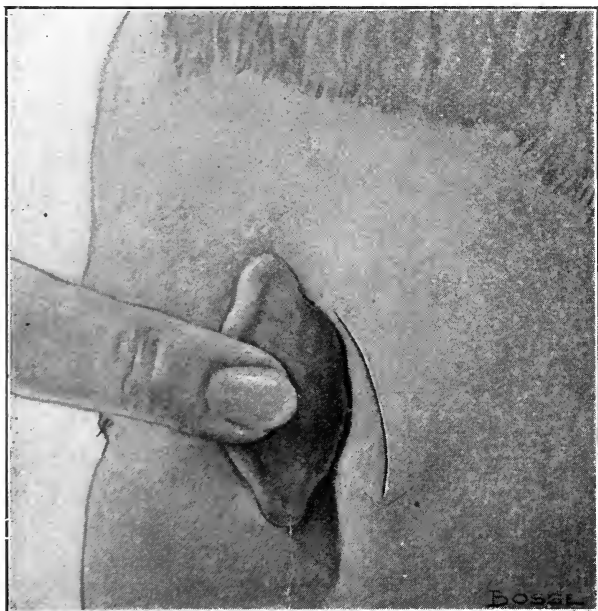


Fig. 4. Showing the line of primary incision from the middle of the mastoid tip upward. The auricle turned forward.

Brain abscess presents nothing characteristic of childhood. Meningitis may develop through invasion of the cavum cranii through perforation of the tegmen tympani, through the labyrinth and porus acusticus internus, or in younger children, through the various open sutures, or subarcuate hiatus. In the great majority of cases the meningitis is basillar, but it is tubercular when following a tubercular otitis.

Sinus involvement presents no special characteristics; only,

the initial chill is often absent, replaced however by vomiting and convulsions; furthermore, the fever is usually atypical.

VIII. TREATMENT.

Before discussing the treatment of suppurations of the middle ear in childhood, I will briefly dwell upon some prophylactic measures or movement, especially during the exanthemata.

The care of the ears during an attack of any of the exanthemata should be greatest during the period of greatest emaciation—usually when the disease has almost run its course. Simultaneously with the time when kidney and other lesions are watched for, the ears should be guarded, and danger to them only then considered as past when the entire rhinopharynx has become normal in state and appearance.

Every effort should be directed to remove mucus or other exudate in the pharynx, through thorough cleansing with warmed alkaline washes, and in younger children by the use of swabs.

Swollen turbinates should be kept within bounds by the judicious use of adrenalin and minute doses of cocain locally applied.

The removal of hypertrophied adenoid tissue during the course of a general disease, is a question which must be decided individually for the given case. Among those advocating its removal at once we find Knyvett⁷¹, and Scheibe⁷² points out that the otorrhea following exanthemata persists longer in resisting treatment when adenoids and hypertrophied faucial tonsils are present than would otherwise obtain. Personally, I have removed adenoids toward the end of an attack of scarlet fever in a case where restlessness, recurrence of fever, and reddening of the drum warned the attending physician that the ear was endangered. No otorrhea resulted in this case. I may say, however, that the child did not seem very much prostrated by its scarlatinal attack, and the relief afforded to nasal breathing and the blood letting, consequent to the operation, may have materially helped the abortion of the threatened ear involvement.

The treatment of middle ear suppurations in infancy and childhood will not materially differ from that administered to adults, except as modified by the peculiarities of the parts in childhood.

Internal medication must of necessity, because of tender age, be cautious.

The application of leeches, is condemned, but the application of tincture of iodine painted on the skin behind the ear, in the beginning stages has brought the writer good results. The application of heat and cold are hardly practical in the younger patients. The pharynx must be kept clean, and pharyngeal and nasal obstruction must be minimized or entirely removed (Ostman⁷³, Weiss⁷⁴, Love⁷⁵ and others).



Fig. 5. The bone surgery completed in the performance of the simple tympano-mastoid operation on the two and one-half years old subject. (Drawing from author's specimen.)

While formerly some differences of opinion existed as to the advisability of early paracentesis, I believe the profession is now as one in regarding it as the first measure to be undertaken. Nor is it necessary to wait until a purulent exudate is demonstrable before proceeding to paracentesis; it is my opinion that it is better to open the drum too early than too late, since when properly performed, under the rules of asepsis, paracentesis presents no dangers.

The incision should be made in the inferior posterior quadrant, after thoroughly cleaning the external auditory canal.

In advanced cases, I employ a small suction apparatus which under full illumination draws the secretion (very often thick and fibrinous) from the middle ear into the canal, from whence it is washed away. A wick of gauze is then introduced (private practice) into the incision, this gauze being moistened with a weak bichlorid of mercury solution (1:5000), and the canal lightly tamponed, and over the whole a wet dressing and bandage are applied. After ten hours, systematic douches of warm bichlorid of mercury (1:5000) are administered.

If the secretions are thick and viscid, the douche is preceded by a few drops of diluted peroxid of hydrogen solution.

I desire to deprecate the insufflation of all powders, or the employment of evaporating solutions containing ether or alcoholic solution of powders, as these leave a coating of their contents, after the volatilization of the liquid, on the canal and drum, and after repeated use tend to block up the canal and prevent drainage.

When symptoms indicate the involvement of the antrum mastoideum (in infants) or the mastoid process in older children, provided the case is seen early in its course (within the first week), then I employ induced hyperemia according to the method of Bier, and although this method has not yet been adopted universally, it early appealed to me as best suited in children's cases, and I feel that by its employment I have seen cases clear up which otherwise would have come to operation⁷⁶.

In cases coming under observation later in their development, where fever persists, where pus is evidenced under high pressure, where granulations present early through the perforation, or grave symptoms of intracranial involvement supervene, I believe more is to be gained in the child's interest by early operation than by the indefinite extension of the expectant treatment, and upon such cases I accordingly operate.

Whether to perform a simple or a radical operation must be determined for each case. With evident bone necrosis in childhood, the radical operation affords the better chance for recovery, for it must again be emphasized that underlying such are usually a tubercular, scrofulous or syphilitic basis, and the little patient is better off when these diseased areas are radically eviscerated.

Finally it may be remarked as almost axiomatic of the treatment of suppurations of the middle ear in infancy and childhood, that the efficiency of treatment decreases progressively with the duration of the ear disease.

IX. TYMPANO-MASTOID SURGERY.

It is not my purpose here to rewrite the anatomy of the

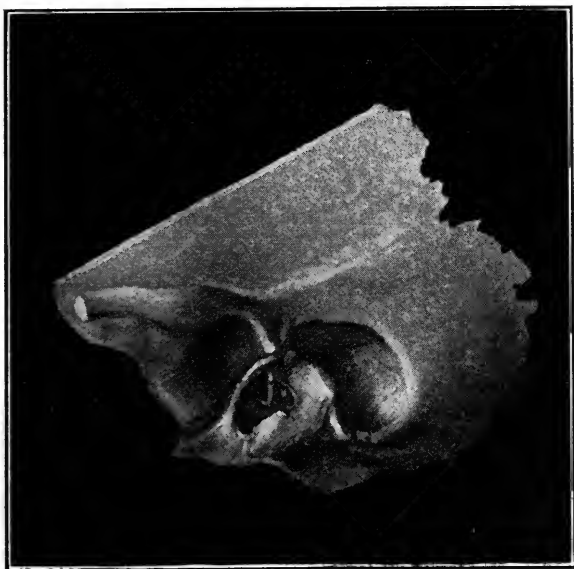


Fig. 6. The radical operation completed up to the removal of the ossicles. The point of breaking through from the antral opening to the tympanic cavity is shown. The anterior and inferior wall of the osseous external canal has been removed to better expose the unremoved ossicles. Author's specimen, aged two years.

temporal bone, but to call attention to certain peculiarities of the child's temporo-mastoid region in sufficiently detailed a manner to make clear why I have adopted the procedures detailed below.

As already explained in the chapter on anatomy, the external auditory canal and its relations to the surrounding bony structures are of vital importance to the surgery of this region.

Closely adherent to the superficies meatus, its roof follows the contour of the squamosa. Its direction from the concha is, generally speaking, downward, forward and inward. See figure 1.

Noteworthy is the fact that in early age the roof of the canal is bounded superficially by the superficies meatus. This superficies meatus is the bent part of the squamous plate overlying the auditus. See figure 2.

From the direction of the superficies meatus and the external auditory canal, it follows that the attachment of the auricle to the underlying bony parts is at a higher level than that of the tympanic membrane, and the line of incision which is to give approach to the middle ear in the child will have to be brought to a higher level than the annulus tympanicus, and the superior wall of the external auditory must be separated at its roof from the superficies meatus.

The separation of the soft external auditory canal from the superficies meatus must be carefully carried out in retracting the soft parts to expose the bony surface above the annulus tympanicus. I have never found it necessary to incise the canal to view the tympanic membrane through it, so as to identify it, as recommended by S. Oppenheimer⁷⁷, and I consider the possibility of infecting the cartilaginous and soft parts of the external ear as a danger, when such a procedure is attempted.

The next anatomic structure peculiar to the young, the existence of which, so far as this stage of the operative procedure is concerned, will be of importance only when operating on infants and young children, is the mastoido-squamous suture. This suture is found externally on the temporal bone, unossified in the very young, ossified in older subjects, but equally well marked, extending downward from a small distance above the temporal ridge, marking off the squamous plate from the more or less rudimentary mastoid process. It occasionally persists through life, is usually wide in infancy and early childhood; and the primary incision, when made down through the skin to the bone, should be carried backward toward the mastoid tip to prevent the knife from entering the squamo-mastoid suture and injuring the soft parts at its line, or the facial nerve at its point of emergence from the skull, this nerve having a very superficial point of emergence during the early period of life. Oppenheimer (l. c.) quotes

Stiles as having called attention to this danger; and McEwen found the suture persistent on the operation table in cases aged twelve, thirteen, fourteen, eighteen and twenty-nine years.

On the inner aspect of the temporal bone, along the line of squamoso-mastoid suture, we find the petro-squamosal suture, containing, in the young, the petro-squamosal sinus. While this is not of very great surgical importance, still when

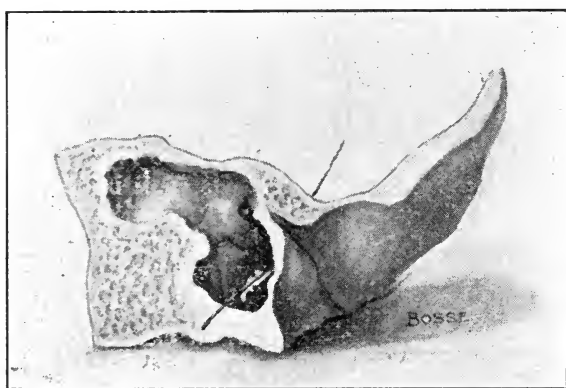


Fig. 7. A section cut as indicated in the shaded portion of Fig. 3; showing middle ear (tympanic cavity), additus ad antrum, and antrum. A bristle has been passed through the existing defect in the tympanic floor coming out through the roof of the jugular bulb. Author's specimen, aged two years.

retracting the soft parts, should the petro-squamosal sinus persist, its injury may result in directly infecting the cranial cavity, with its contents. Furthermore, the squamoso-mastoid suture marks the lower and posterior limit of the descending plate of the squama, and this is the line behind which we must expect to find the sigmoid sinus. No matter how small the temporal bone, it is rare, indeed, to find the sinus further forward than the external evidence presented by this suture. See figure 2.

Our next step in the procedure is to determine the place for opening the antrum. In very young children the antrum is all there is of the mastoid.

The mastoid antrum and middle ear are much nearer the surface of the skull in the young than in the adult, and their

position relative to the overlying parts differs so much from the adult type that other landmarks must be relied upon to locate it. Neither the spine of Henle nor the suprameatal triangle is a sufficiently constant guide for the safe performance of the operation. Of all the landmarks, the most constant is the ridge of bone formed by the posterior root of the zygoma. This ridge, by its lower border, indicates the level of the roof of the mastoid antrum, above which, a few lines in distance, will be found the level of the base of the brain. This ridge, sometimes designated as the supramastoidal crest, is formed by the obliquity of the angle between the auditory plate of the squama (in the young), and the rest of the squama. It is sufficiently constant to furnish a reliable guide to the upper limit of safety in entering the antrum and avoiding the cranial cavity. See figure 2.

The tympanic cavity communicates with the antrum by means of the aditus ad antrum and the epitympanic space, commonly and erroneously designated the attic. The epitympanic space is that portion of the tympanic cavity lying superior to a line passing through the short process of the malleus, and containing the head and neck of this ossicle and the short process and body of the incus. Locating the epitympanic space on the external surface of the skull, we find it, in the child, directly above the tympanic membrane, almost in the middle of the upper part of the arch spanning the annulus tympanicus. Posterior to it, the antrum inclines slightly toward the back of the head as the child ages, until this cavity presents itself as usually found in the adult type of the bone. See figures 3 and 7.

SIMPLE OPERATION.

Therefore, the soft parts retracted, the external auditory canal separated from the underlying bone, the root of the zygoma and the supramastoidal crest identified, and the position of the squamoso-mastoidal suture determined, we next proceed to destroy the outer wall of the antrum, which, lying high, is opened at a point a few lines behind and above a plane drawn through the handle of the malleus. Opening the antrum thus, the facial nerve is avoided, being protected in this region by the overhanging horizontal semicircular canal. (See figure 8.) From this opening the cortex is easily removed backward toward the squamoso-mastoidal suture, the underlying bone and cell detritus removed with the spoon.

curette and sponges, and the purulent contents completely eviscerated. As we reach the squamoso-mastoidal suture, a hard plate of bone is encountered—the inner table of the skull—and under this the sinus is to be expected. I have never found it necessary to curette the aditus in the simple operation on the child, nor do I permit the curette to enter the epitympanic space. The danger of dislocating the ossicles, or of injuring the facial nerve has always seemed to me too great to hazard such risks.

The operation as above described affords sufficient counter-opening to effect drainage, paracentesis having been performed before the case comes to the operating table.

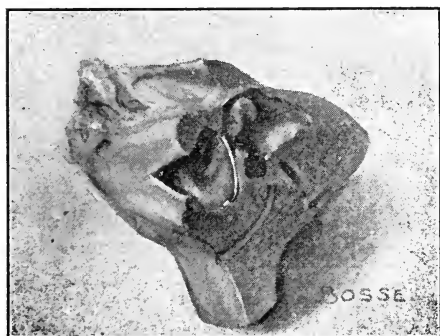


Fig. 8. A section of the temporal bone of a two year old subject, through the facial in its descending line. The distance of the facial from the drum is evident, and the protection to the nerve afforded by the horizontal semicircular canal is shown by the overhang of this canal. The relations of the ossicle, as exposed, to the semicircular canal is also shown. Drawn from the author's specimen.

The usual result from this operative procedure is to give clean granulating surfaces which heal entirely without trouble or incident under proper precautions during the post-operative period, the skin wound being kept open until the granulations reach its level. (See figure 5.)

To summarize the successive steps of the simple tympano-mastoid operation on the young:

1. Primary incision through the skin and soft parts, down through the periosteum to the bone, the incision starting directly over the middle of the mastoid tip and being carried

by a curvilinear sweep toward the auricular attachment upward to the upper pole of its insertion, distant one-quarter inch from it. (See figure 4.) I prefer to make this incision from below upward, for this furnishes another guard against injury to the facial nerve at its point of emergence from the skull.

2. Gentle efforts to retract the wound edges are now begun. Periosteum is pushed backward beyond the squamoso-mastoid suture, the auricle gently bent forward on itself, is pulled forward and downward; the soft external auditory canal is carefully separated at its roof from its adhesions to the superficial meatus; and then the external ear, with its canal, is pushed forward and downward until the tympanic membrane is seen. This must positively be identified. Bleeding points have in the meanwhile been secured, and the operative field is now exposed.

3. We next identify the landmarks, the zygomatic root, the ridge running from it, and the squamoso-mastoid suture. The point of election for entering the mastoid antrum is then located, provided no fistulous opening already points the way to the suppurating cavity. This point of election is directly above and a little behind the arch of bone spanning the upper pole of the membrana tympani, and with a slight tap of the chisel the bony wall is broken through. Occasionally, a "spongy" spot is discernible, and many authors follow this as a guide through which to enter the antrum. Personally, I have not found it a reliable sign. Many children's bones were found to be of so vascular a structure that its demarcation from the surrounding bone tissue was not always clear.

4. The antrum open, the cortex is easily removed, by means of a curette, backward to the tip, care being exercised as the squamoso-mastoid suture is approached. The tip is removed, leaving only a shell of bone, and the operation is completed by removing all diseased tissue, not forgetting the cells at the root of the zygoma. Unless these cells are examined, and, if diseased, eviscerated, the object for which the operation was undertaken will be defeated.

5. The operative procedure closes by lightly packing the bone cavity with gauze. One strip of iodoform gauze is placed in the deep part, and covered with plain sterile gauze in one strip, the end of which should protrude beyond the skin wound and be lost in the external dressings. This single strip

packing will greatly facilitate proper drainage, and it is a better procedure than packing the cavity with small pieces. A strip of plain gauze is placed in the external auditory canal, and the external dressings are applied.

Regarding the change of dressings, it can be said that the longer the primary dressings are left in place the better, and although the outside dressing and bandage may require change because of soiling, it is better to wait until the mastoid cavity

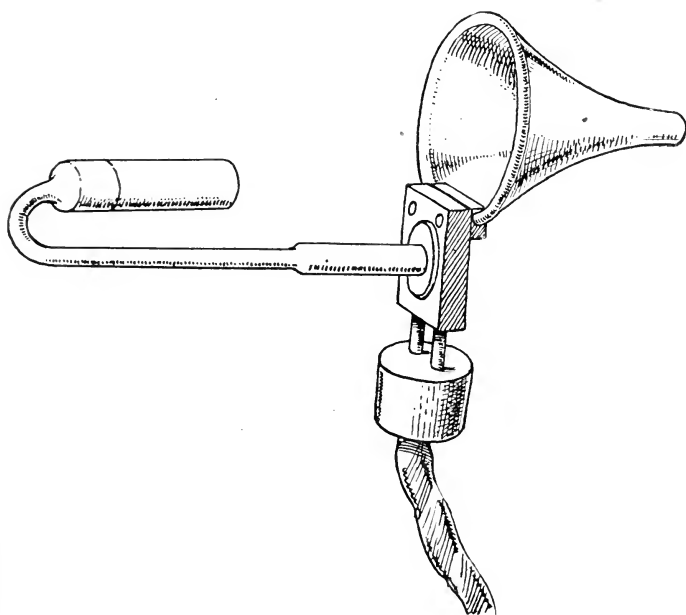


Fig. 9. Drawing of the author's speculum for examining children's ears with the Wappler electric attachment for direct illumination.

has begun to discharge (after five days), and the packing becomes thoroughly wet, before its removal is attempted, because then the change of dressing is less painful, and consequently will not be resented by the young patient. However, should there be any indication for an earlier inspection of the wound cavity, this should be undertaken as soon as it is required.

THE RADICAL OPERATION.

The location of the landmarks, and the initial steps leading the way to the antrum, are similar when performing the radical operation to those in the simple procedure as above described. The peculiarities of the temporal bone of the young which it is necessary to mark for the correct and safe performance of the radical operation, are, first, the spot where the least danger exists in connecting the antral cavity, as opened in the simple procedure, with the tympanic cavity, so as to form one connecting cavity. Here the danger of dislocating the ossicles plays no role, but the chance of injury to the facial nerve is a potent danger. Every effort should be made to avoid it, since, as McEwen⁷⁸ has pointed out, injury to the facial in infancy or during the active developmental period of the facial bones and muscles, will arrest growth on that side and lead to disfigurements in excess of that caused only by motorial paralysis.

The nearer we make the connecting passage to the zygomatic root the safer the procedure. I have repeatedly tried this on the cadaver and have since verification, used it at the operating table, and I now feel that by breaking through from the antral opening directly above or near the position held by the malleus there is afforded an absolutely safe route for the primary step; the facial nerve, at this point having passed into the deeper parts of the petrosal pyramid, is not within range of the chisel or gouge, when these are carefully used.

We break down the root of the zygoma, and remove the remaining portions of the ossicular chain, endeavoring to keep the stapes intact and in situ, or at least to maintain its foot-plate in position. (See figure 6.)

The antral opening connected with the tympanic cavity, this cavity itself next receives our attention. In the child this cavity presents two characteristics peculiar to its stage of development. First, the mouth of the Eustachian tube is wide and easily entered by a small curette; the bony walls are exceedingly thin, and great care must be exercised lest in curetting the bony wall separating it from the carotid, this wall be injured to the damage of that vessel.

The second characteristic of the child's tympanic cavity is its floor which, covering the jugular bulb, is a very thin plate of bone. I have often found defects in this floor, with the

dome of the jugular bulb in direct contact with the lining membrane of the tympanum, hence I recommend the utmost care when curetting in this neighborhood. (See figure 7.)

Unhappily, the amount of material is not large enough (see anatomy section), to warrant me in citing my statistics, but the presence of these dehiscences in the floor of the tympanic

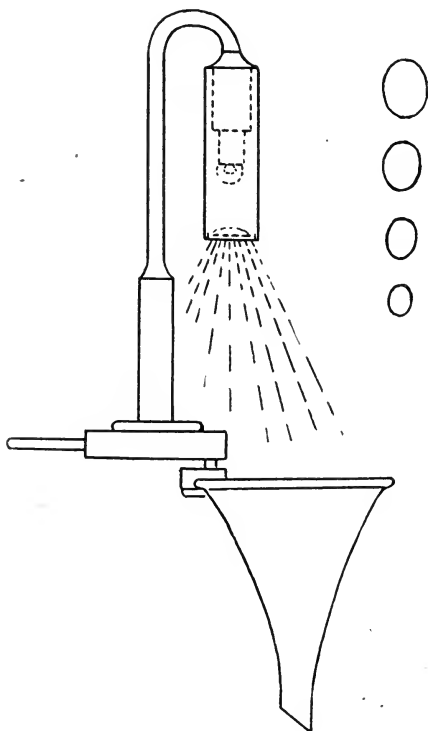


Fig. 10. Same as Fig. 9, only drawn in outline to explain mechanical parts and give outline of areas to be seen with the various sizes of specula.

cavity has occurred sufficiently often to impress upon me the danger of rupturing the jugular bulb, and I have discarded all sharp instruments in this region, contenting myself with a thorough sponging with gauze until satisfied that the bony floor is intact.

The tympanic cavity cleared of granulation and detritus,

the partition dividing it from the antrum is removed under full illumination, and the facial canal, standing white and hard (at times evidencing dehiscences in its wall with the nerve exposed), is located against the darker spongy bone. The little bridge between antral opening and tympanic cavity is gradually broken away in small pieces and the radical operation—that is, the formation of a large, irregular connecting cavity, merging tympanic, antral and mastoid cavities—is finished.

That is to say, the bone surgery is now completed, but to insure the best results a flap is cut from the soft tissues of the external auditory canal, so that the cavity may more rapidly become filled by granulations and its interior epidermatized. This flap must be so constructed as to provide easy access for treating any part of the bony cavity during the post-operative period.

The flap best adapted to children's cases has proved, in my experience, to be that devised by Panse. After the flap has been cut the edges are turned back and held in place by small pledgets of gauze. I find it best, in children, not to suture the post-auricular wound, but to encourage healing by granulation. The wound is packed with regard to holding the flaps in position, in a way similar to that described for the packing of the simple operation. The dressings remain unchanged until after the sixth day, when I have usually found the flap edges adherent. Further treatment of the wound differs in no way from that after the simple procedure.

The advantage of this method of handling the flap lies in the fact that it is cut at the time of operation, requiring no second anesthetization of the patient, and the wound, remaining open behind, facilitates approach to the middle ear for treatment and inspection during the healing period. The end results, so far as cosmetic effects are concerned, are as good as when the flap is primarily sutured, provided care be taken to prevent the edges of the skin from turning in during the progress of healing.

To summarize the steps of the radical operation:

1. After the antrum has been opened and the evisceration of the tympano-mastoid cell has been completed, the bridge of bone arching the tympanic ring is broken through from a point as near the middle of the superficial meatus as it is possible to go, nearing the zygomatic root rather than inclining away from it.

2. Granulations and detritus are removed from the tympanic cavity, including diseased ossicles.

3. Careful curettage of the Eustachian orifice.

4. Careful sponging of the floor of the tympanic cavity to identify dehiscences, and if such are found absent, then curettage of the floor. When dehiscences are identified, diseased tissue must be removed through sponging or by the use of thumb forceps.

5. Cutting the Panse flap and tamponing the edges of this flap in position through the external ear, packing the post-auricular wound with one strip of gauze, and finally placing the outside dressings in position.

FAULTS OF TECHNIC.

The osseous canal being less and less evident the younger the subject, the part played by the squamous must be remembered. As the result of the canal being attached at its roof to the superficies meatus, the auricle is situated high relative to the membrana tympani, and a common fault is failure to detach the canal roof from the bony wall, and because of this the cranial cavity is unnecessarily opened. I have found a false opening into the cranium in a case under observation within the year, made because of this fault, and the operator in this case failed to uncover the antrum.

Contrary to the case in the adult, where the antrum is usually higher than is supposed, in the child it will be lower if the primary incision is not properly made and the soft canal carefully separated from the superficies meatus. Oppenheimer (l. c.) calls attention to the fact that the squama, instead of occupying an almost vertical position, is inclined, making an acute angle with a horizontal plane, and causing the linea temporalis to overhang the external auditory canal. This overhanging portion might be mistaken for the temporal ridge, and the operator, instead of opening into the antrum, will open the cranial cavity. Through gentle persistence in retracting soft parts until the membrana tympani is recognized the unusual position of this ridge will be identified and this fault of technic averted. Many operators make the supra-meatal triangle their guide. In the child neither this nor Henle's spine, if it be present, can be depended upon. The position of the antrum is so different at different ages that

these landmarks can no longer be accepted as reliable guides in the surgery of this region in the young.

In closing this paper I wish to call attention to the red-marrow bone character of the cells in the young subject. Very often, after the central focus of infection has been removed by the operator, he will proceed to eviscerate and enlarge the bony cavity indefinitely, expecting to find hard bone; but when it is remembered that in many cases the developing temporal bone of the child is soft and of red-marrow, and easily broken with the currette, such a mistake of technic can hardly happen.

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XLIII.

THE INFLUENCE OF IMPERFECT NASAL RESPIRATION ON THE ORAL CAVITY.*

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The current of air which passes in and out of the lungs during twenty-four hours travels through the nose on an average of 20,000 times each way in normal respiration. Here it is relieved of particles of solid matter; its temperature is regulated to nearly that of the body, and the necessary moisture is supplied for its reception by the delicate lung tissues ⁽¹⁾. It has been calculated that during a day two quarts of fluid is supplied by the nasal structure to the inspired air.

These important physiologic functions of the nasal cavities attracted but little interest in this country until Bosworth ⁽²⁾, about twenty years ago, called attention to them. Soon after Aschenbrandt ⁽³⁾, Kayser ⁽⁴⁾ and Block ⁽⁵⁾ published exhaustive experiments which they had made. From that time to the present these functions have received more or less consideration.

It is as essential that the air be prepared by the nose before it enters the lungs as it is for the food to be prepared by the mouth before it enters the stomach.

During normal nasal respiration the lips are closed, the teeth of the opposing jaw are in contact, and the tongue completely fills the oral cavity with the exception of a small space between the dorsum of the tongue and hard and soft palate. This space, according to Metzger ⁽⁶⁾ and Donders ⁽⁷⁾ has a negative manometric pressure of from 2 to 4 m. m.

In this position the muscles are in a state of balance or tonicity which, in accordance with the generally accepted opinion, maintains the relative position of the jaws to each other. The muscles of the lips and cheeks on the one side

*Read before the American Academy of Dental Science at Boston, Mass., March 6, 1907.

and the tongue on the other exert equal pressure upon the alveolar arch.

If nasal respiration be obstructed, by faulty function or weakness of the alae, hypertrophy or hyperplasia of the mucous membrane and glandular structures of the nose and nasopharynx, atony of the turbinal bodies, abnormally placed structures, narrowly constructed bony frame-work, new growths, or any other cause interfering with the free passage of air, the nasal respiration is partly or completely abandoned; and, as a result, air must pass through the mouth, a cavity not intended for such use, and certainly unfit to properly prepare the air for the lungs.

In order to continue oral respiration the mandible is depressed, increasing the tension of the muscles and tissues of the cheeks, the lips are separated, the tongue instead of adhering to the roof of the mouth and pressing against the inner aspects of the upper teeth, lies free in the floor of the mouth, and the soft palate is drawn up instead of resting upon the base of the tongue. To maintain these abnormal positions without fatigue the muscles producing them must hypertrophy.

If nasal respiration be only partly obstructed, the voluntary muscles are often able to continue nasal respiration during the waking hours, but as soon as sleep abolishes the voluntary function then oral respiration begins. This explains the statement so often made by parents, that their child seems to breathe through the nose during the day, but when asleep breathes through its mouth, which constitutes a third or more of each twenty-four hours.

The constant passage of air, which is often dust-laden, over the mucous membrane of the mouth, fauces, and respiratory tract soon dries those tissues and lowers their resistance to pathogenic bacteria. The teeth also become carious, especially the upper ones, because these are more exposed, the lower teeth being partly protected by the tongue and saliva.

When nasal respiration is impossible, the mouth must perform two functions during the ingestion of food: that of preparing the food for the stomach, and supplying air to the lungs. This causes a peculiar and disgusting manner of eating.

The baby at the breast requires about fifteen or twenty minutes for the ingestion of a single meal. Under normal

conditions it does not remove its mouth from the breast during that time, but, if nasal breathing be impossible, oral respiration must be resorted to, and as a result the baby can suck the nipple only a short time before partial asphyxia forces it to stop nursing. This procedure is repeated many times until hunger is satisfied, or, more often, the baby is exhausted by its efforts to supply the stomach and lungs at the same time. Either a moderate amount of milk mixed with air is swallowed, or an insufficient amount of nourishment is taken. Both tend to produce indigestion and malnutrition.

When the child begins to ingest solid food a similar condition exists. Instead of being able to properly masticate its food, it must bolt it—with a continuation of indigestion and malnutrition.

It is an established fact that oral respiration is not so deep and long as nasal, and as a consequence the interchange of gases within the lungs is not so complete (⁸). This allows an excess of carbon dioxide to remain in the blood, and a deficiency of oxygen to be absorbed. Kyle (⁹), confirms this later statement by his findings in a series of examinations of the blood of persons with nasal obstructions. He found in every case, before removal of the obstruction, a reduction in the number of the red corpuscles which are the oxygen-carriers. In some instances as few as 1,500,000 were present, 5,000,000 being the normal. The hemoglobin was found to be only 50 to 60 per cent. of the normal, and in many cases there was a slight increase of the white corpuscles.

After nasal respiration had been established the cells and hemoglobin gradually returned to their proper number and percentage.

Oral respiration also interferes with sleep. Instead of a quiet, restful sleep it is often interrupted with sudden awakenings and exhausting dreams.

Thus we find, as a result of oral respiration, indigestion, due to improperly prepared and digested food; impoverished blood, resulting from an incomplete exchange of gases within the lungs; and insufficient sleep which so weakens a growing child that not only is dentition delayed and decay of the teeth started, but the bony framework of the head and body is retarded in growth, and the resistance of the whole body is lowered to the invasion of pathogenic bacteria, es-

pecially the oral cavity and respiratory tract, due both to the local and constitutional conditions.

In the earliest medical writings we find mention made of a peculiar facial expression and deformity of the superior maxilla associated with mouth-breathing.

Since the appearance of Wilhelm Meyer's (¹⁰) work on "Adenoid Vegetations," this facial expression has become known as the "adenoid facies." It may, however, be caused by other nasal obstructions. The face appears long, the point of the nose is pinched, the lower jaw hangs down, the mouth is open, the upper lip projects away from the teeth, the inner canthi of the eyes are drawn downward, the eyebrows raised, while the obliteration of the natural folds of the face gives to a person a stupid, vacant, semi-idiotic appearance. There is often a widening of the bridge of the nose, which is frequently crossed by a prominent vein.

The deformities of the superior maxilla, while not so constantly associated with mouth-breathing as the facial changes, are quite as characteristic. There is lateral narrowing of the alveolar arch, high palate, and prominence of the upper incisor teeth which tend to approach one another posteriorly. The occlusion of the teeth of the upper jaw, which are apt to be irregularly placed, is imperfect with those of the lower. As a rule the lower jaw is normal. The exception is generally when there are rachitic deformities in other parts of the body.

Although the association of these changes with oral respiration has been observed for centuries, still there appears to be a diversity of opinion as to the relation between cause and effect. Some consider the interference with nasal breathing as the cause of all variations from the normal, which the upper jaw may exhibit, while others regard these variations as the cause of the nasal obstruction.

In support of the former opinion we find several theories advanced to explain the way in which these deformities are produced. We will briefly consider only the most plausible ones.

(1) It is an acknowledged fact that the inactivity of an organ often prevents its development. In applying this to the nasal chambers through which air does not properly pass, there are two factors, which by some are considered of prime importance in preventing the perfect progress of the development of the upper jaw. One is the abeyance of the

natural functions, with the want of proper blood supply; the other is the absence of the mechanical force of the air upon the walls and sinuses of the nose. If these statements be true, the nasal chamber and the superior maxilla as a whole would be smaller in all dimensions, and the hard palate high and narrow.

(2) If we apply the same fact, that the inactivity of an organ prevents development, to the act of mastication which by mouth-breathers can only be imperfectly performed, we have another factor in preventing proper development of the upper jaw and perfect occlusion. Cryer (¹¹) is of the opinion that the loss, on account of oral respiration, of the developing and moulding influence, which directly results from the percussive force of occlusion exerted by the mandible upon the maxillary arch is of great etiologic importance in the irregularity in the upper dentures, and (¹²) that the lack of constant occlusion of the teeth is another important factor in not forcing the teeth and the alveolar processes outward.

(3) The continual downward and inward pressure against the lateral alveolar processes of the superior maxilla by the muscles of the cheek, which support the hanging mandible, and the absence of the backward pressure of the obicularis oris muscle upon the anterior teeth and their processes, have a detrimental influence upon the developing upper jaw teeth, especially during the early growing period and second dentition.

The existence of the lateral pressure of the cheek muscles can be demonstrated by placing a finger between the upper row of teeth and the oral surface of the cheek. When the jaws are opposed there is practically no pressure upon the finger, but if the jaws be separated there is then a decided pressure.

The question naturally occurs: why does not this force exert similar pressure upon the mandible? This has been answered by the constant lateral pressure of the tongue.

(4) The nursing baby exerts during each *meal at the breast* a negative pressure of about 75 c. m. of water upon the oral surface of the palate. This force is exerted many times a day during the most rapid growth of the bones of the body. Again, if we accept Metzger's and Donder's statement that there is a vacuum between the upper surface of the

tongue and hard palate, when the mouth is closed, then these forces tending to pull the palate downward would be absent during oral-respiration.

(5) Hubbard (¹³) and Dawbarn (¹⁴) are of the opinion that there is a downward pull exerted upon the palate by adherence of enlarged faucial tonsils to the pillars of the fauces. If this force has any influence upon the shape of the palate, then the opposing muscles, the levator palati, which are on a constant tension by mouth-breathers, must also play a part.

As a proof of the theory that the interference of nasal breathing does have an influence in the abnormal development of the superior maxilla, the experiments of Ziem (¹⁵) and Collier (¹⁶) may be cited. Ziem found that by artificially occluding one-half of the nose in young animals there occurred an asymmetrical development of the two sides of the nose and adjacent bone tissues, the obstructed half being undeveloped. This arrest of development extended to all adjacent tissues on that side. Collier produced deformities of the upper jaw in young animals, chosen indiscriminately, by blocking their noses for a long time with cotton wool.

As additional evidence of the influence of oral-respiration upon the upper jaw, I will briefly report the condition of two of my patients. One was a girl seven years of age, whose brother and sister had normal arches and occlusion. The mother was a strong, broad-faced Swede. Father dead. This child fell from a chair when a baby, striking on its face. When I examined the child, December, 1905, I found the cartilaginous part of the septum bent in such a way as to obstruct both nasal passages. The child had breathed through its mouth since the accident.

The other patient was a boy seven years old. His parents were both large, with normal heads. His brother and sister both had normal arches and perfect occlusion. The mother knows of no accident to account for an irregularity of the external shape of the nose, but says the child has breathed through its mouth for a long time. On examination, January, 1907, I found an angular deviation of the cartilaginous septum, obstructing both nasal cavities. This irregularity is certainly the result of trauma, and of long standing.

Both parents had a high palatal arch, V-shaped alveolar arch, a moderate degree of malocclusion and decay of nearly all the upper teeth.

In opposition to the theory just considered there is the one that the deformity is primary and nasal obstruction secondary. Siebenmann (¹⁷) and his scholars, Fraenkel (¹⁸), Grosheintz (¹⁹) and Haag (²⁰), are the most ardent supporters of this theory. They devised an instrument (Palatometer) with which they measured the width of the alveolar arch and height of the palatal arch of different individuals with and without "adenoid vegetations," this being the principal cause of nasal obstruction which they considered. From these measurements they calculated an index, and by comparing these indices they arrived at the conclusion that individuals with "adenoid vegetations" had relatively the same height of palatal arch as normal, and are of the opinion that the high palatal and V-shaped alveolar arches depend upon the type of the skull. The normal type (Chamoprosope) being the broad face with the wide nasal cavities and dome-shaped palate. The abnormal type (Leptoprosope) the one with a high, narrow face, narrow nasal cavities (Leptorhine) high palatal arch and V-formed alveolar arch. They believe these types depend upon the congenital racial characteristics of the skull, and not upon the extrauterine influence of nasal occlusion.

Siebenmann says, in explanation of the common association of palatal deformity with mouth-breathing: "That the individual with a high palate, without exception, has narrow nasal cavities, and the swelling of the nasal mucous membrane, which is rarely absent with 'adenoid vegetations' becomes more obstructive when the palate is high and narrow than when low and broad; consequently oral respiration is seen more often in individuals with a narrow face."

Other theories of the cause of palatal deformity have been advanced from time to time, principal among which is rickets. Löwy (²¹) believes the changes of rickets is the cause of all irregularities of the superior maxilla and nasal septum.

Stone (²²), while studying the deformities of the spine in rickets, made some valuable observations regarding the cause of deformities of the superior maxillae. He has no doubt that there is a relation between obstruction of nasal respiration and these deformities, but thinks the deformities depend much more definitely on the severity of the rickets than on any other single factor. He found that usually in rickets there is an hypertrophy of the faucial and pharyngeal tonsils; and believes this increase of lymphoid tissue is a part of the

disease, and that both the deformity and nasal obstruction are the result of the rachitic process rather than the result of the nasal obstruction.

Schlauss (²³), admitting that rickets does cause deformities of the upper jaw in isolated cases, believes the principal cause is due to abnormal osseous union of the palatal bones (Synostosis).

Rickets being a disease due to malnutrition, it seems reasonable to believe it may, in a few cases at least, be secondary to the indigestion and impoverished blood which we have shown often results from oral respiration.

The theory that deformities of the superior maxilla are congenital, depending upon the racial characteristics of the skull and not upon extrauterine influences, has only clinical evidence for its support, while the theory that these deformities are acquired, principally from the influences produced by the obstruction of nasal respiration, has the support of animal experiments as well as that of my two cases, and I am sure that nearly every rhinologist has seen cases where the nasal obstruction was acquired and the palatal deformity resulted, without any question of a congenital narrow skull or the influence of rickets.

Parsons (²⁴) is of the opinion that the narrow skull formation, which is considered congenital, may be acquired, due to anterior nasal stenosis. He bases his belief upon the presence of a long continued external atmospheric pressure upon young and soft bones, caused by the negative pressure within the nasal fossae and sinuses which would occur at each inspiration.

Accepting Parsons' view, we would not expect to find so marked a deformity of the upper jaw when the cause of the nasal obstruction was located in the nasopharynx, such as an enlarged pharyngeal tonsil. This is partly true, but in a majority of mouth-breathers, from post-nasal obstruction, there also exists an anterior obstruction. Under such conditions the palate usually has its characteristic deformity.

There being no known single factor to account for the cause of all the deformities, and as each theory of the different causes is supported by careful observers, we must at present, at least, conclude that the deformities may occur in given cases, as stated.

I believe, however, that the greatest number of all de-

formed superior maxillæ are acquired and are undoubtedly a result of oral respiration, due principally to the loss of constant occlusion of the teeth and imperfect mastication, secondarily to the pressure of the cheek muscles and absence of the stimulating influence of nasal respiration upon the developing nasal fossæ and sinuses.

I do not believe the adhesion of enlarged faucial tonsils to the palatoglossus muscles, the absence of the suction-chamber between the tongue and palate and loss of the negative pressure during nursing has much, if any, influence upon the shape of the palate and teeth.

A lesser number of maxillary deformities are congenital, as those found in a narrow head.

The least number are due to rickets and other mentioned causes.

The logical treatment of the patients in whom interference with nasal respiration is the cause of palatal deformity, should be first to remove the nasal obstruction, and second, to correct the palatal deformity. This is supported by the fact that the characteristic facial expression and palatal deformity associated with oral respiration improve after nasal respiration has been established. The degree of the improvement, especially of the palatal deformity, depends upon the age of the individual and the length of time the deformity has existed. The earlier the nasal obstruction is removed the better the results, both in preventing oral deformities and in correcting it when it has occurred.

The treatment of the individual with a congenital narrow skull should be first to widen the palate, for this, we know, often widens the nasal cavities (²⁵), which in many instances is sufficient to produce nasal respiration. If, however, the widening of the palate does not allow respiration to take place through the nose during the day and night, then the rhinologist should correct any intranasal irregularity. The rachitic patients, I believe, can be helped by establishing normal nasal respiration.

As a result of a careful study of the uncivilized races, in whom mouth-breathing and irregularities of the teeth are

*This widening of the nasal cavity has been observed clinically for twenty years or more, but, so far as I can find, has not been confirmed by intranasal measurements. Since writing this article I have made intranasal measurements which prove that widening of the hard palate does widen the nasal cavity.

rarely found, Catlin says: "If I were to endeavor to bequeath to posterity the most important motto which human knowledge can convey, it should be in three words—Shut your mouth."

This, as we are well aware, is impossible for many members of our civilized society, and it is our duty as orthodontists and rhinologists to assist these unfortunates. We can, through our single or combined efforts, change the mouth-breather with a stupid, expressionless appearance and disfiguring irregular teeth to a nose-breather with an active, intelligent appearance and attractive, regular teeth.

CONCLUSIONS.

Imperfect nasal respiration causes partial or complete oral respiration which through its influences tends to produce the following:

1. Indigestion.
2. Impoverished blood.
3. Lowered resistance, especially of the upper teeth and respiratory tract.
4. Deformities of the superior maxilla, with imperfect dentition, both in quality and position.

The treatment of these conditions often require the combined efforts of the orthodontist and rhinologist.

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XLIV.

THE DUTY OF RESTORING HEARING BY OPERATION IN CHRONIC AURAL SUPPURATION.

PRESIDENTIAL ADDRESS DELIVERED BEFORE THE WEST KENT
MEDICO-CHIRURGICAL SOCIETY, MAY 3, 1907.

BY CHARLES J. HEATH, F. R. C. S.,

LONDON, ENG.

Aural appendicitis is the name by which chronic aural suppuration might be known, for disease of that mucous *cul-de-sac* the mastoid antrum or appendix of the ear is responsible, according to my investigations, for the perpetuation of the discharge. Like appendicitis in the abdomen, that in the ear is also a latent danger. In both situations it is a grave disease on account of its liability to infect neighboring and vital parts. In the abdomen it may cause local abscess or fatal septic infection of the serous peritoneum (peritonitis); in the ear it may cause local or cerebral abscess, or fatal septic infection of the jugular vein or the serous pia mater (meningitis). Now no careful surgeon waits for abscess in abdominal appendicitis, nor in my opinion should he wait for it in the ear, for just as removal of the abdominal appendix will eradicate the danger there, so will timely elimination of the aural appendix usually restore the ear to function and to safety.

Before alluding to the investigations resulting in the proof of these opening words, some of which were recorded in *The Lancet* of 11th August, 1906, and others last week (*The Lancet*, 27th April, 1907), I will ask you to examine this patient, Mary Long. Her illness of five years ago has rendered her a person of great interest, for the restoration of hearing which accompanied the repair of the drum of her ear encouraged the hope of ultimately discovering how this remarkable reparative power could be made generally available, for thousands are deaf and die from this disease. She had suffered for many months from a foul aural discharge. This culminated in acute mastoiditis, and the disease having thus become critical operative relief was urgently needed. The disease had already

destroyed the posterior fourth of her drum-membrane, and the operation I performed was adapted to the condition of the ear. The mastoid process being extensively diseased was all removed, and the antrum was opened as far forward as the attic of the tympanum. The posterior wall of the bony meatus and parts of the attic bridge and tympanic ring were also removed. The small bones and the remains of the drum-membrane were retained and preserved from injury, and though the tympanum was full of granulations they were left untouched. She rapidly recovered. And now you can see there is no external disfigurement, and no internal sign to indicate that she had had an operation nor that anything has been amiss with her ear. The extensive damage to the drum-membrane has been repaired, and there is full restoration of hearing. Careful observation of her recovery encouraged other investigations, and thus little by little information was obtained, which, by the institution last year of an appropriate operation, has led to the restoration of hearing in over a hundred persons. There can be no doubt that in time to come vast numbers will receive similar relief. This sudden change in treatment is due to the recognition of our ability to restore hearing by the new operation, and implies dissatisfaction with the old radical method which does not do so. (See discussion at British Laryngological and Otological Association, *The Lancet*, 15th Dec., 1906, and *British Medical Journal*, 5th Jan., 1907.)

It would be well now to briefly relate the course of these investigations.

In 1904 I endeavored to render more satisfactory the method known as the radical or complete operation, which was the one in general use; but I found, among the other defects of that severe measure (which was founded on the assumption that it was necessary to clear out the drum as well as the mastoid antrum in order to effect a cure), that removal of the drum-membrane which is part of the proceeding destroyed all chance of full restoration of hearing, and further there was no certainty of saving the little that remained. Therefore I returned to the study of the means by which nature had assisted this patient, Mary Long, to make such a remarkable recovery. Her case was referred to in *The Lancet* of 11th August last as Case No. 10, M. L., and she was exhibited at the Otological Society in 1904.

Observation of her ear after operation proved that the drum possessed great capacity for repair. Thus encouragement was given to continue these researches, in the hope that the information thus acquired might eventually be a guide to some effective method of evading the disappointments of the destructive radical operation which was practically in universal use. Close attention was therefore given, during and after the performance of many operations, to the state of the tympanic walls, to the changes that appeared in the small bones removed from the ear, to the pathologic conditions found in the mastoid antrum, and to the relation they might hold to those in the tympanum. Also to the conditions present in those patients in whom acute disease had caused destruction of the whole or a large part of the drum-membrane and ossicles, and where no tympanic barrier existed to free drainage from the dangerous mastoid antrum. Observation of these and other matters resulted in the conclusion that, if the antrum could not recover its health when there was no tympanic obstruction to its drainage, then the operation known as ossiculectomy (*i. e.*, removal of drum-membrane and small bones), with the object of influencing the disease in that cavity, was futile, in spite of the sacrifice of the vibrating apparatus and consequent certainty of defective hearing (*The Lancet*, 27th April, 1907). Treatment of the tympanum through the meatus, by dealing also with the effect and not with the cause of this disease was usually found equally ineffective and in early cases even worse; it was, as it were, "fiddling while Rome is burning," for the delays such proceedings must entail were found to give time for the affection to advance beyond the point at which restoration of hearing might be brought about by operation.

During operations it was also found that slight disease may exist in the mastoid antrum, yet not be identified because of the obscuring presence of blood, and that all hemorrhage must be prevented if trustworthy observations were to be made.

Now these studies have shown, as clearly as such things can be proved, that the mastoid antrum is affected in every case of chronic aural suppuration—that is the plain teaching of careful observation of upwards of 500 operations. It was only by the performance of operations that this most important information was forthcoming, and even then it could not be demonstrated except when absolute freedom from hemorrhage permitted of full and critical view.

Conclusions thus founded left little doubt that, though the original disease may have affected the whole middle ear, the mastoid antrum was the part which was least capable of recovery, and was, therefore, the locality where disease was most prone to persist. The chief disease was therefore shown to be not in the tympanum but in the mastoid antrum and its communications in the petro-mastoid bone, and that these parts must be eradicated in order to ensure safety to life and to restore the hearing, for discharge from that *cul-de-sac* was found capable, even if only of small amount; of perpetuating and increasing the disease in the tympanum, and thus causing destruction of the drum-membrane.

It was proved, too, that granulations, polypi, and mucous swellings in the tympanum, which had hitherto been considered as implying grave disease of that chamber, far from being so, were generally found to be protective and beneficent and secondary to the advent of irritating secretions from the mastoid antrum, and spontaneously disappeared, with restoration of the drum and hearing, when these secretions were cut off by this conservative operation (*The Lancet*, 11th August, 1906, and 27th April, 1907). Discharges from the mastoid cavity were also shown to be capable of causing caries in the tympanum and facial paralysis, and these are grave conditions which might easily progress so far as to cause labyrinthine suppuration, meningitis, and death. Even these dangerous complications were also proved to be amenable to the same operative remedy without loss of the drum-membrane or of hearing (*The Lancet*, 27th April, 1907).

Two important questions, however, arose here—firstly, whether this aspect of the pathology, which was contrary to that hitherto taught and generally accepted (and upon which the old radical operation was founded), could be relied upon; and, secondly whether these conclusions, although drawn from a very large number of careful clinical observations, were correct. It was difficult to settle these matters except by designing an operation in accordance with these fresh observations and performing it in a sufficiently large number of cases. This course was adopted in May last year, when in a month nine such operations were performed. The results of those operations, with a description of the measure and a record of the case of this patient, Mary Long, were published in *The*

Lancet of 11th August. The patients who underwent this surgical treatment (I have named it the conservative operation, as it preserves all the structures essential to good hearing) were exhibited before a meeting of the British Laryngological and Otological Association on the 9th November last (1906).

In the discussion at that meeting the Fellows were unanimous in their expressions of approval of the results of the operation (*The Lancet*, 15th December, 1906, and *British Medical Journal*, 5th January, 1907). It has since become extensively adopted and is steadily displacing the radical operation, as the following short record will attest. It illustrates the trend of opinion, though it is from the practice of only three of the many surgeons who have lately adopted this operation, and they have authorized the publication of their names.

Dr. Percy Jakins, Surgeon to the Central London Throat and Ear Hospital, has recently performed twenty-nine mastoid operations for chronic aural suppuration, and of these twenty-five were by this new conservative method.

Dr. Frederick Spicer, Surgeon to the Metropolitan Ear and Throat Hospital, has lately done fourteen mastoid operations, of which nine were by this conservative method. He mentions in his letter his intention to exhibit the patients, so complete is their recovery.

Mr. John Bark, Aural Surgeon to the Stanley Hospital, Liverpool, has lately done between twenty and thirty mastoid operations, of which all but two were by this conservative method, and the last twenty were all carried out in that way. He says the results are so good that he has twice exhibited the patients—viz., at the Conjoint meeting of the Lancashire, Cheshire, and North Wales Branch of the British Medical Association at Chester (see *British Medical Journal*) and also at the Liverpool Medical Society.

A few of my patients (eighteen) have already been exhibited at the British Laryngological and Otological Association; some were referred to in *The Lancet* of 11th August last, and others last week (*The Lancet*, 27th April, 1907). The cases mentioned were of old standing; but if the operation were done earlier, and therefore before disease has much advanced, it would be suitable for almost every case, hearing would thus be saved and future danger avoided.

You need no further evidence of the necessity of this measure now you have heard these records of the practice of others,

and you all can read the brief record of the discussion at the British Laryngological and Otological Association on 9th November last (*The Lancet*, 15th December, 1906, and *British Medical Journal*, 5th January, 1907).

Let me now draw your attention to a few of the advantages of this conservative operation. The following five paragraphs have been drawn up by Mr. Bark, one of those surgeons whose names have been mentioned; he writes thus—

(1) "Your operation does not destroy the drum (as does the old complete or radical method) nor jeopardize the hearing, therefore it can be performed early and before disease has caused much destruction. It can also be performed on and thus restore and save the only useful ear (as in Case 1, *The Lancet*, 27th April, 1907). Neither the radical operation nor ossiculectomy can be adopted under such conditions for fear that total deafness will follow the destruction of the drum.

(2) "From this operation there is practically no liability to facial paralysis.

(3) "It is a less severe surgical proceeding than the radical operation, recovery is quicker, and yet it removes the dangers of this disease.

(4) "It will restore hearing in the majority of cases that come under treatment, and if done early in practically all.

(5) "The same operation is suitable for acute or chronic suppuration."

Those are Mr. Bark's words and experiences, and they are reflected in his methods, for his last twenty operations have all been performed by this method. His remarks are endorsed by Drs. Percy Jakins and Frederick Spicer.

It might be well to briefly supplement them, for as originator of this treatment it was desirable that I should know the limits of its usefulness. These investigations have shown that full recovery may take place in the old as well as in the young, and apparently after disease of any duration (it has been proved up to thirty-two years), also that perforation in any part of the drum-membrane will heal, though in some situations more readily than in others. Further, if the affection of the ear is complicated with disease in the brain, the latter can be dealt with, as can also thrombus of the lateral sinus, without destroying the hearing. I have in one case dealt with the brain; to deal with the lateral sinus is somewhat easier, as it is further from the ear. The operation has also been safely

performed in a case of acute mastoidities occurring in the course of chronic suppuration in an old person (sixty-eight years) suffering from aciduria and diabetes. The operation was quickly performed and but little ether administered, though it is not as a rule so suitable as chloroform.

There are three more patients here for your inspection and to illustrate some of the advantages of the operation; they were all exhibited before the British Laryngological and Otolological Association on 7th December last, though they were not then described.

The first one you might examine is this young man, Thomas Vaughan. He was admitted to the Throat Hospital at the end of October with acute mastoid disease. The discharge from his ear had lasted six weeks, and when admitted at eight o'clock one evening he suffered so much from vertigo that he needed assistance, for he was unable to stand alone. (For the cause of this vertigo see report of similar cases in *The Lancet*, 27th April, 1907.) Operation was performed at once. The disease being extensive, the whole mastoid process was removed. The perforation was found to be large and badly situated for extensive healing, so if other conditions more favorable for repair had not been present one might have been disposed to perform the radical operation and remove the drum-membrane. He was, however, by the conservative method given the chance of complete recovery. Next morning, at nine o'clock, he was found reading the newspaper quite free from pain and shock, and this satisfactory condition should be attributed mainly to the short duration of the operation (half an hour). The importance of the rapid performance of these operations is not sufficiently recognized, and any detail which will shorten their duration should be taken advantage of, for those patients recover most quickly who are but a short time under the anesthetic. It was interesting to watch the closure of the large perforation, and you can now observe that the drum-membrane is intact and his hearing good.

The next patient is this man, Alfred Peaks. He suffered from the condition until lately known as "attic" disease, because the perforation was in the loose upper portion of the drum-membrane where it covers in the lower part of the attic of the tympanum, and he could not hear my watch when placed in contact with his ear. This showed that his labyrinthine sensibility was impaired. There was a polypus grow-

ing from the attic and protruding through the perforation into the meatus, which recurred after removal; the antrum was filled with thick pus and granulations, yet there were no symptoms to indicate this perilous condition. The surgeon who waits until danger is imminent waits too long, and some of his patients will die! In a recent publication (*The Lancet*, 27th April) it was clearly proved that affection of the attic could not be differentiated from that in the tympanum, and that both were dependent on mastoid disease. By acting in accordance with this pathological fact, and removing from this patient (Peaks) all the mastoid disease, and that only, the attic trouble, being secondary to and depending upon it, was allowed to get well. You may now observe that there is complete recovery, the discharge has ceased, the perforation healed, the hearing returned, and therefore the same conservative measure is shown to be effective in this upper or so-called attic variety of the affection as in the lower and commoner sort, and as both conditions have been proved to be due to disease in the mastoid antrum they should be regarded simply as varieties in the complications of that disease (*The Lancet*, 27th April, 1907).

Now had ossiculectomy been performed on this patient (*i. e.*, removal of the drum and small bones), as a few surgeons still recommend for this attic disease, not only would there have been failure to reach the dangerous disease in the mastoid antrum, but that operation would doubtless have caused deafness, for it was pointed out last autumn (*The Lancet*, 11th August), that persons with deficient sensibility of the labyrinth do not hear without a drum. Therefore, radical operation too, as hitherto almost universally practised, by removing the drum, would for the same reason have been a misfortune and destroyed his hearing. He is, I believe, the second person who has been relieved by operation from attic disease without destruction of the drum, the first being a girl on whom a similar operation was performed in hospital last October. To her this matter was of far greater importance, as the affected ear was her only useful one, and was being gradually destroyed by the disease (*The Lancet*, 27th April last). As this patient Peaks had no urgent symptoms, and as I desired to avoid operation, he was treated for months without actual benefit, but with what has since been found to have been risk to life and hearing, for at the operation the disease was dis-

covered to be chiefly in the mastoid antrum, and was therefore beyond reach by any other proceeding. In a similar case this line of treatment should not be repeated, but safety to life and hearing should be ensured earlier by operation on the same conservative lines as those that were finally adopted.

The last patient is this boy, Edgar Spencer. He was admitted as an urgent case to the Throat Hospital during my absence attending the meeting of the British Laryngological and Otological Association (on 9th November) of which mention was made just now. The President had expressed a wish to see this method of operation, so he was informed of the admission to the hospital and was present with other surgeons when it was performed. The boy had been delirious at night for a week, and the purulent contents of the mastoid antrum were found to be under great and serious pressure. It is the rule, during the performance of this conservative operation, to carefully examine the drum-membrane and be guided by its condition (for it is often impossible to see it before), and the proceeding is so adapted as to permit of this inspection. When exposed in this boy's ear it appeared like a piece of wet scarlet cloth. No signs of normal structure were visible, nor any outline of the malleus, nor indeed of the situation of the perforation, for it was occluded by the granulations which filled the tympanum. I remarked that there was a perforation somewhere, and that it could be found with the aid of a probe. A slender instrument was passed gently over the surface until it found its way through the opening, and the dimensions of the aperture were shown by moving the probe to and fro. The operation was completed, and at its conclusion I expressed the firm conviction that the perforation would be healed within a month. It was actually healed on the ninth day after operation, although it had been in existence seven years. The boy went home on the fifteenth day with restored hearing, and if ever he is called upon to perform such exceptionally responsible duties as those carried out by his father in the police, there is at least the satisfaction of knowing that deafness will no longer render him unfit for the duty. He had suffered all these years from aural suppuration following an attack of scarlet fever, and had thrice undergone operation for the removal of adenoids with the hope of arresting the discharge. You will now understand that, if it was impossible to see this perforation during the operation when the drum membrane

was as visible as a coin in the palm of the hand, how useless are the usual attempts to treat the tympanum through such a perforation and a tiny meatus. Further, how futile such treatment must now appear, for it can at last be recognized that the chief disease is not in the tympanum at all, but in the mastoid antrum, where these investigations have shown it to exist in every case, and there the tympanic treatment cannot reach it.

These three patients are much indebted to the other one (Mary Long), for had it not been for her illness and the information derived from observation of her remarkable recovery I should have removed their drum-membranes by the usual radical operation, even last year, and they would now be deaf. Such cases are clear proof that by this radical measure patients were rendered permanently deaf at a time when the method adopted on these four patients is capable, as you see, of restoring the ear to full health and usefulness. Surely this practice must be altered! Yet many surgeons object to sudden change, however necessary or beneficent, and some still practice the old radical operation alone.

Three of these patients were treated at the Throat Hospital and at the time of operation were in great danger, and you should know that more sufferers are admitted to that Hospital in a condition dangerous to life from this disease than from all others together. You thus will learn how grave a complaint is this one of aural suppuration and the serious attention it demands, for the mastoid antrum is the seat of danger (*The Lancet*, 11th August, 1906). It was by early interference alone that my operations were freed from mortality.

While preparing this address I was summoned to the country on two successive days to operate on patients with mastoid disease which had become acute, one of whom had recently attended a special hospital. The first was found to be dying from meningitis, the second had passed away before my arrival. It is difficult to refrain from condemning the dilatory methods which so generally prevail and are responsible for such calamities, and from insisting on the necessity of earlier operative assistance, for thus alone can safety be assured.

Though the dangerous mastoid conditions can be removed by this operation, the damage to the drum and hearing resulting from long standing disease may have gone beyond repair. The small bones, too, may have necrosed and disappeared, as

sometimes happens in scarlet fever and other acute disease, but this does not occur in chronic suppuration. For such sad cases there will still be the radical operation, but it is a measure far too drastic for general use, yet until now there was no other remedy. The surgeon's aim should be the restoration of a perfect ear, and after seeing such cases as those before you, surely he will be content with nothing less!

The membrane of the middle or hinder brain is often exposed in the foul mastoid cavity from destruction of its bony walls; it is over fifty times as common there as above the attic of the tympanum. Rarely is there warning of this danger! Bone, too, is a weak barrier against disease: one far more effective is the dura mater. That white and shiny membrane alone is the "silver streak that prevents invasion" of the brain it may be for months or years!

Now it has been shown that the mastoid antrum, and not the tympanum, is the chief seat of danger and disease, the old treatment must be changed, for we no longer have the right to dally with such risks. Faith in lotions will abate, for they do not reach the goal. Operations, now bereft of their destruction of hearing and their former dangers, will be earlier done. They will, I doubt not, increase ten-fold, hearing will thus be saved, and deafness and the many deaths from this disease should well nigh cease.

Not one in 100 of these poor sufferers has hitherto undergone operation in time to save the hearing, and even when performed the old operation destroyed the drum; but you now have proof that a wholesome change is coming.

It is sad, however, to contemplate the condition of those whose hearing has been destroyed by the radical operation which until lately was the only remedy for this disease. Before last May such patients as those you see would have had their drums removed, and previously others thus suffered at my hands whose hearing might have been saved had I but sooner found the true pathology. That pathology was recorded in no written book, it could not be demonstrated post mortem, so it had to be sought by years of study in the living book of nature. It needed the performance and careful observation of hundreds of operations in order to gain the knowledge which induced me to design last year, and largely practice since, the operation which has restored to the patients you see there and to scores of others their safety and their hearing.

Do not neglect a suppurating ear! Some surgeons have held it of little importance; the public has believed them. Through you and others they must know it is a danger to hearing and to life. The old operations had some dangers and also destroyed the drum; then there were valid reasons for delay. Now those reasons are removed, for operation by the new method has hitherto been followed by no deaths, and hearing can be restored.

These observations of disease were most instructive. Much information yet remains for those who will search for it and ponder on what they see. The more one knows, the more one sees there is to know. One after another the old theories of tympanic affection have collapsed under the searchlight of operations performed at various stages of this disease. The last to fall was that of attic disease, as in this patient, Alfred Peaks (see discussion at the British Laryngological and Otological Association, *The Lancet*, 15th December, 1906, and *British Medical Journal*, 5th January, 1907.)

Abdominal appendicitis has long been subdued; that of the ear has now surrendered to our assaults. Thousands are still endangered by it. Let us restore their safety and their hearing, for with the power there surely comes the duty!

XLV.

SOME CONSIDERATIONS RELATIVE TO THE LYMPHOID TISSUES OF THE FAUCES IN SYSTEMIC INFECTIONS.

BY J. L. GOODALE, M. D.,

BOSTON, MASS.

At the meeting of our association last year, I presented some suggestions with regard to the examination of the throat in chronic systemic infections. The special points covered by this paper were the pathologic alterations in the faucial tonsils which induced or permitted infection of the system by pathogenic microorganisms. During the past year, work has been carried on along these lines, and a number of matters have suggested themselves to me, which I shall present to you for your consideration and discussion.

The histologic unity existing between the faucial tonsils and the lymphoid follicles of the posterior pharyngeal wall and of the pillars is well known to you all. You cannot fail to have been struck by conditions of acute infection from pyogenic microorganisms, limited to the pharyngeal follicles in the absence of inflammation of the tonsils. Furthermore, we have all of us, I suppose, encountered cases where we have with care extirpated faucial and pharyngeal tonsils, and nevertheless the individual has experienced sore throat subsequently, with varying degrees of frequency and severity. It is my belief that the responsibility with which we have charged the tonsils in the etiology of acute infection, should be shared in many cases by or wholly assigned to the lymphoid structures in the vicinity. Furthermore, while we have in the past been pursuing our examination of infections arising through the throat with painstaking care, disproportionate emphasis has been laid upon the pathologic alterations of the tissues of the throat, in comparison with the receptivity of the host. At a time when the study of opsonins is being undertaken in all our pathologic laboratories, this seems a particularly favorable moment to direct your attention to the part played by the system in resisting invasion by microorganisms.

At the last meeting of our association, I referred to several instances of infectious arthritis, where extirpation of the tonsils had been followed by marked relief in the joint symptoms. I have not reported these cases in detail, since such a report will be given later by the orthopedic surgeon. In the last twelve months numerous cases have been examined with regard to the possibility of the throat being an entrance point for the rheumatic infection, and in a certain number of these cases the history of the affection, and the appearance of the throat seem to justify extirpation of the tonsils. While a certain number of these operations have been followed by improvement from the orthopedic point of view, I have seen at least one case where a continuance of the joint inflammation was observed, in association with symptoms in the throat. This case seems to be of sufficient interest to report from the standpoint of the laryngologist.

The patient, a man 45 years of age, was seen in December, 1905, with a history of recurrent attacks of rheumatism, beginning three years previously, each attack being ushered in by soreness in the throat. The inflammation of the joints were followed by progressively increasing stiffness, so that at the time of my first examination walking and movement with the arms were performed with difficulty. The tonsils were moderately enlarged, the right showing several large crypts, containing much cheesy detritus. The right showed crypts in general smaller, which, however, contained a considerable amount of whitish bad-smelling material. I removed the tonsils completely at this time. Examination of the excised tissue showed conditions which I have elsewhere previously described, consisting in general of irregular contractions of the organs with dilation of the crypts at their base and narrowing of their orifices. Convalescence from the operation was slow, but otherwise uneventful, and during the remainder of the winter and spring marked improvement was apparent in the joint symptoms, so that the individual was able to walk much more freely than before. During the following summer, attacks of rheumatism again appeared, in association with recurrence of soreness in the throat. Examination then showed a small pocket behind the site of the left tonsil formed by adhesion between the posterior pillar and remains of the tonsillar fold left from the operation, containing much cheesy detritus. This pocket was incised several times, until it remained open. Dur-

ing the following three months the throat remained in a comfortable condition, and no exacerbation of the arthritis was noted. In January the throat again became sore, and acute inflammation was noted in several joints. Examination of the throat now showed marked reddening and swelling of the lymphoid tissue behind the left posterior pillar, which persisted for several days, and disappeared with an improvement in the joint pains. In February another attack of soreness in the throat was noted, with fresh exacerbation of joint symptoms. Examination of the throat now showed swelling of several lymph follicles on the left side of the pharynx, one of them exhibiting a white spot in its center, corresponding to the crypt or central invagination of the follicle. This was treated by applications of silver nitrate, which the patient applied himself at home daily. Improvement in the throat and acute joint symptoms followed rapidly. At the present time the patient is making daily applications of silver nitrate in an eight per cent solution to the pharyngeal granules, and for a period of eight weeks has experienced no soreness of the throat or exacerbation of his joint symptoms. It may be said that in general the condition of his joints is not essentially different from that manifested about a year ago at this time. What improvement has been noted may be fairly attributed, I think, to orthopedic treatment.

From the history of this case it seems reasonable to draw the following conclusions: If we grant that a form of arthritis exists due to infection by one or more varieties of microorganisms, we are impelled to seek for the point of infection, and experience has shown that it is probable in certain cases that an infection atrium exists in the throat. Our knowledge of the pathology of the faucial tonsils would render it probable on theoretical grounds that these structures constitute the most frequent portal of entry of all the pharyngeal tissues. This hypothesis has been confirmed by the post-operative results of a certain percentage of cases. In the history which I have just reported, there seems a reasonable ground for assuming that after extirpation of the tonsils, infection of the joints occurred through the lymphoid structures of the posterior pharyngeal wall. Such a hypothesis is strengthened by our knowledge of the different forms under which acute pyogenic infections of the throat may occur. It is a familiar experience to us all to encounter cases of acute

pharyngitis, characterized by reddening and swelling of the pharyngeal follicles in the absence of inflammatory manifestations in the faucial tonsils. In severe instances, each follicle may exhibit a small central white spot, at the summit of its convexity corresponding to its central invagination or crypt. While we have no data in regard to the histologic phenomena involved in such an infection, yet it seems fair to transfer to those conditions our relatively exact information concerning acute lacunar tonsillitis. Here, as you know, a development of pathogenic bacteria takes place in the crypts of the tonsils, with formation of toxins, which are absorbed into the tonsillar tissues. Through the chemotatic properties of the toxins, emigration of leucocytes occurs from the blood vessels of the vicinity into the crypts. These leucocytes together with desquamated epithelial cells constitute the white spots seen in simple acute proliferative tonsillitis. Where the bacterial toxins are stronger, coagulation of the albumin in the superficial tissues of the crypts occurs, with formation of fibrin, as a result of which the area of white about the lacuna is widened.

As shown by Theobald Smith in the case of animals, tubercular infection may occur through normal mucous membrane without leaving any trace of its penetration discoverable by the naked eye or by manipulation. Jonathan Wright has reported a case of penetration of the laryngeal mucous membrane by the bacilli of tuberculosis. In several of the cases of tubercular cervical adenitis which I reported to you last year, the tonsils were of normal clinical appearance, and yet either showed tubercle bacilli in their interior, or when inoculated into guinea pigs produced tuberculosis in the animals.

In certain individuals whose tonsils have been extirpated, manifestations of acute follicular pharyngitis have occurred with as great frequency as before the operation, and it seems reasonable to suppose that the cause of these frequent bacterial invasions in such individuals was not primarily attributable to a faulty disposition of his lymphoid elements so much as to a predisposition to such infection on the part of the individual himself.

These facts seem therefore to render necessary an enlargement or modification of our previous conceptions as to the role played by the tonsils in the etiology of acute systemic infections. While experience has shown that the faucial tonsils

are the most vulnerable point of entrance for microorganisms, and while certain previous pathologic alteration in these structures favor such infections, yet we are nevertheless impelled to believe that normal lymphoid tissue presents no barrier. Such a belief brings us very directly to a consideration of the part played by the host itself in relation to the pathogenic microorganisms.

Our conceptions of this subject have been recently greatly extended by the work done by Wright and others in regard to opsonins and the role in immunity or immunization. When now we are called and given a case, to examine the throat as to its constituting an entrance point for infection, it is of importance to consider not alone the pathologic alterations in the tonsils which may be encountered, but also evidence of change in the lymphoid tissue in the vicinity. Furthermore, even if such structures are found on inspection clinically normal, we are not thereby enabled to say that they have not been in the past points of entrance for microorganisms. Of chief importance under such circumstances is the history of the case. If the individual has in his previous attacks of systemic disease experienced coincident disturbances in the throat, this fact becomes of great importance. If it is possible to test the opsonic index of the individual with reference to the microorganisms recovered from the throat which is suspected to stand in etiologic relation, confirmatory evidence would thereby be obtained.

XLVI.

A CASE OF PROFOUND STREPTOCOCCIC INFECTION OF AURAL ORIGIN TREATED BY OPERATION AND VACCINATION WITH ANTI-STREPTOCOCCIC SERUM, FOLLOWED BY DEATH FROM MENINGITIS.*

BY W. SOHIER BRYANT, A. M., M. D.,

NEW YORK.

This case is interesting for two reasons: First, because of the profound streptococcic infection which was responsible for a fatal issue; and, secondly, because our most determined efforts with the antistreptococcic serum proved futile.

The sequence of events was as follows: Mastoiditis with profound streptococcemia of aural origin; operation; lateral sinus thrombosis; evacuation of clot and excision of the internal jugular vein; inflammation of the wrist on the affected side and of the shoulder on the opposite side; meningitis and encephalitis; and, finally, death.

Maria V., aged 23. Family history negative. Previous history: Acute otitis following a "cold," with tenderness about mastoid and high temperature for over 14 days. Screamed with the pain for three days. She had received treatment at her home by her family physician. The day before admission, the afternoon temperature was 103 degrees. On entering the hospital, the patient had the appearance of one very ill.

Examination.—There was abundant discharge from right ear with slight edema around ear and tenderness over mastoid. Slight tenderness along side of neck, no glands along jugular. Heart and lungs negative.

The complete mastoid operation was performed under ether—there was little pus in the cells and no granulations. The bone was firm and showed no signs of disintegration. The sigmoid sinus was opened just below the knee and bled freely. The wound was lightly packed with iodoform gauze, and a wet saline dressing applied. Examination of a culture speci-

*Read before the New York Otological Society, May 28, 1907.

men from the mastoid pus showed the virulent and dreaded streptococcus.

Post Operative History. 1st day.—Wound dressed. The dressings were saturated with the discharge. The external meatus was dry. Upper part of the mastoid wound was healing by first intention; the lower angle where the drainage lay, was full of purulent material. The sides of the opening were covered with false membrane. Iodoform gauze was placed in the wound and a wet saline dressing applied. Urine negative.

2nd day.—There was general constitutional improvement. Cavity of wound was filled with bloody pus. Edges of inferior angle of wound sloughy, upper part healed by first intention. Pustular dermatitis of neck below mastoid. Packing removed and replaced by gauze soaked in horse serum.

3rd day.—Some improvement, less swelling and tenderness of neck, dermatitis nearly gone. Pain in and about ear. Wound all sloughing, reddish yellow pus, with the odor of formic acid. Horse serum packing again used.

4th day, a. m.—Wound very sloughy. Full of flocculent yellow orange fluid. Neck better. Horse serum dressing re-applied.

p. m.—Dressed case again. Wound this time dry and clean, bled a little. Cleaned it with H_2O_2 and washed with saline solution. Wet 1-5000 bichlorid outside dressing. Urine negative. Pus taken from the wound gave streptococcus pyogenes and a few staphylococci.

5th day, 12 m.—Skin of neck healthy. Induration along neck and over course of internal jugular vein. Patient was slightly cyanotic, but intelligent and alert. Tongue slightly coated. Pulse small, rapid, regular. Soft systolic murmur at apex. No enlargement of spleen. Abdomen slightly tympanitic.

Dr. Nathaniel Bowditch Potter was kind enough to see the case in consultation and undertook the streptococcic vaccination.

At 1 p. m.—Streptococcic serum MI given by subcutaneous injection. Wound inactive as before; very slight exudation. No granulations. Dressed with horse serum. Neck was normal. No pain.

2 p. m. Blood report.—Leucocytes 12,400; differential count, Lymphocytes 20 per cent. Polynuclear 80 per cent.

7 p. m.—Redressed wound; almost clean; gauze adherent;

slight bleeding on removal of packing. Reapplied wet dressing; plain gauze packing and horse serum. Blood taken from the finger and gave a pure culture of streptococcus pyogenes. One hour later the leucocytes were 17,100.

6th day, 6:30 a. m.—A chill. The pulse was so rapid and feeble that it could not be taken. Wound not as clean, but moister; patient weaker. Some soreness and swelling deep in neck below ear.

At 12 m.—I resected jugular from clavicle to a point near the jugular bulb. Ether anesthesia. The vein appeared very large; patient's condition very critical; packed and bandaged the wound. The operation was continued in the old wound and the sinus uncovered at bottom of wound. From the knee almost to the bulb, the sinus was dark in appearance, covered with fibrin, and was softer than normal, thereby signifying infiltration. It was opened throughout, but did not bleed. The dark soft clot was removed and a fair amount of bleeding followed from both ends. The stimulation of the patient consumed so much time that the whole operation lasted one hour. Time was not taken to evacuate the jugular bulb thoroughly. The bone was not soft over the sinus; it appeared perfectly normal. Inhalation of oxygen, hypodermoclysis 1000 c. c. salt solution at 120 degrees F., with strychnin 1-30 gr. hypodermically were given.

6 p. m.—Patient has changed color, much whiter; before operation she was yellow and dusky. Skin moist and not feverish.

The clot from the sigmoid sinus and the walls of the excised jugular vein showed the staphylococcus pyogenes. The opsonic index was found to be .86.

Blood Report, 10 a. m., 7th day—Leucocytes 14,800; Differential count. Lymphocytes 10.7 per cent; Polynuclear 89.3 per cent.

6 p. m.—Leucocytes 23,300; Polynuclear 89 per cent.

7th day, 9 a. m.—Patient seemed better. Perspired. Urine increased. Nutrient enemata begun and repeated every two hours. Vaccine M II was administered. The wound looks well, and is nearly clean; gauze packing was red. A few small sloughs were still present in the mastoid wound. Sinus plugs left in place. Dry dressings. There is considerable pain in whole side of head and neck, which is relieved when head is

raised. Patient has been cyanotic in face ever since the tying off of jugular; the cyanosis is very marked unless head is high. Annoying hacking cough. Slight delirium during the night. Voided urine involuntarily. Nutrient enemata were continued, because patient would eat very little.

6 p. m.—Changed outer dressing, sinus clean. Has had bad headache to-day. The opsonic index was found to be 1.0. Blood count, 9 a. m.: Leucocytes 25,000; Polynuclears 87 per cent.

8th day, 9 a. m.—Patient weaker; still cyanotic. There is a little puffiness of eyelids, no pain in head; complains of soreness in left auricle, and inability to pronate the right wrist. All gauze was removed from mastoid wound, which looked fairly clean. Neck wound not wholly clean, but too dry. No granulations. Mastoid wound packed with iodoform gauze, covered with wet bichlorid. Patient complained of pain in wound. The opsonic index was found to be 1.40.

Blood Count 5 p. m.—Leucocytes 26,300; Polynuclears 88 per cent.

9th day.—No special change in the patient or wound. The opsonic index was found to be 1.00. Slept very little, delirious. Blood count 3 p. m.: Leucocytes 17,500. Polynuclears 89 per cent. 8 p. m. Leucocytes 18,500; Polynuclears 88 per cent.

10th day.—Patient very delirious. Changed dressing. Infused 1400 c. c. of salt solution.

p. m.—Dr. Potter observed that the pupils were equal and reacted readily. No sign of meningitis; slight swelling and tenderness of right wrist and left shoulder; considerable headache. The opsonic index was found to be 1.00.

Very restless and delirious at night. Blood count: Leucocytes 16,300; Polynuclears 85 per cent.

11th day.—Since midnight the patient remained unconscious, and died at 5 a. m.

Autopsy, 30 hours after death. Body well nourished. Wound showed no signs of granulation and was covered by a thin dirty secretion. The wounds at the elbows where the hypodermoclysis was given showed no signs of healing; no pathologic condition in the thorax or abdomen other than a purulent bronchitis. The right lateral sinus was thrombosed to the torcular by a black clot. The jugular bulb was also filled with a similar thrombus. There was a small collection of pus at the

lower angle of the neck wound. The under surface of the tentorium and the whole cerebellar cavity were covered by a thin layer of yellow lymph, most abundant in the region of the right lateral sinus and tentorium. Considerable muco-purulent secretion in the right sphenoidal cells.

The brain was hardened and sectioned. The ventricles were found lined with a thin layer of fibrin. There was also a small amount of fibrin deposited over the hemispheres between the convolutions, most abundant on the lateral aspect. The gross appearance was identical with that of epidemic cerebrospinal meningitis.

I am indebted to Dr. Krumwiede for the pathologic and bacteriologic data in this report.

Summary.—This case of profound streptococcic infection went on from bad to worse in spite of surgical intervention and in spite of repeated injections of streptococcic anti-bodies. There was one weak point in the technic of the vaccination as carried out; namely—the antistreptococcic serum should have been prepared from the individual herself. Unfortunately this was not done.

Dr. Potter stated in a subsequent letter that the attempt at inoculation with a streptococcus from a different source had practically no effect upon the patient's opsonic index, just as it had no effect upon her clinical signs. It is possible that the patient's own organism might have produced a better effect, but it is very doubtful whether any such method will influence cases of this type.* Dr. Potter has obtained most satisfactory results from vaccination in streptococcic infection, but only where there were no streptococci in the blood.

Conclusion.—An aural infection may seem to be circumscribed in the presence of severe toxemia. The local necrosis may continue in spite both of surgical intervention and the use of anti-bodies.

*Dr. Potter's article read at the Seventh Congress of American Physicians and Surgeons, Washington, May, 1907.

XLVII.

ROSENMUELLER'S FOSSAE AND THEIR IMPORTANCE IN RELATION TO THE MIDDLE EAR.

By FRANCIS P. EMERSON, M. D.,

BOSTON.

The object of the following paper is to try and point out an important source of infection of the middle ear which has heretofore been overlooked. The literature, clinically, is exceedingly meager, consisting of one paper by Doctor Brunk, which appeared in the August number of the *Laryngoscope*. With this timely and excellent paper, I fully agree. The textbooks, as he pointed out, even the latest, have nothing to offer. Notwithstanding this, I shall try to show that in the fossae of Rosenmueller there is to be found very frequently, in adults as well as in children, a large amount of degenerated tissue. This is more constant than we have supposed and is an important factor in causing or maintaining morbid conditions of the middle ear. When present, it can be seen by posterior rhinoscopy in only a small per cent of cases; therefore a digital examination is necessary for diagnosis, and this should be done as a routine procedure.

Anatomically, Kyle says, "The third or pharyngeal tonsil differs little in structure from the faucial tonsils." This tonsil extends from the median line on each side to a well marked depression termed the fossa of Rosenmueller or recessus pharyngeus which separates it from the Eustachian orifice. The agglomerate glands are most numerous behind the projections which contain the Eustachian orifices (i. e., in the recessus pharyngeus) and are closely grouped together on the upper surface of the soft palate. The term, adenoid vegetations, includes enlargement not only of the pharyngeal tonsil, but also of the closed follicles situated in the mucous membrane of the posterior surface of the vault and the posterolateral walls of the nasopharynx. Later he says that, "pathologically, we really have to deal with four different varieties of enlargement of the pharyngeal tonsil," and adds that, "there is a soft variety which appears as a smooth semi-fluctuating

mass that spreads over almost the entire nasopharynx, which is largely influenced by atmospheric changes and the physical condition of the child." This variety is composed almost entirely of the lymphoid structure, is very friable and is covered with a thin layer of epithelium with ill-formed basement membrane and submucosa. The structure is so soft and friable, that it can easily be broken up by pressure with the finger. The enlargement seems to be due to an overdevelopment of lymphoid tissue.

In another variety, which may be called edematous or cya-



Fig. 1. Bands passing from the posterior and upper part of the recessus pharyngeus to the Eustachian eminence.

notic, there is very little increase in the actual gland-structure, but the enlargement is due to venous stasis and edema produced by leakage from the vessels. This is the variety that is directly associated with intestinal irritation and irregularities in systemic circulation most commonly observed in children who are suffering from some form of intestinal parasites. The structure is smooth and tense, although easily compressible.

In the hard or hyperplastic variety, there is an increase in the lymphoid structure with a decided overgrowth in the connective tissue element. The mucous membrane lining is well

formed and there are usually several layers of epithelial cells. The surface is more lobulated, although smooth to the touch.

Clinically, it would seem to be the first variety which by retrograde changes produces the pathologic conditions found in the fossae. This tissue normally should undergo physiologic atrophy from the tenth to the fifteenth year; but digital examination shows it to be still present in the fossae. It is, I believe, an active factor in the causation of recurring attacks of salpingitis in adult life. Its position and constant reinfection may be one of the active causes of lateral pharyngitis. The investigations of Goodale and others in tracing the focal source of infection of the cervical and bronchial glands, as well as the apex of the lungs, to the tonsil and adenoid tissue, must lead us also to have the fossae of Rosenmueller in mind. This is particularly true as often the recessus pharyngeus is very deep and contains a large amount of soft friable tissue offering an ideal harbor for microorganisms. The lymphatic connection with the cervical nodes makes the fossae second only to the tonsil as a direct source of infection. With the Eustachian tube, it not only from its position offers a harbor for bacteria causing a low grade inflammation which infects its orifice, but mechanically it interferes with the action of the levator palati and the tensor palati muscles. That it is an important factor in obstructing the venous return current from the tympanum and labyrinth is shown in the marked relief of some cases of tinnitus.

This was shown in instances where the tube was not occluded and therefore could not be attributed to ossicular impaction from atmospheric pressure. Clinically, its arrangement is as follows:

Fig. 1. One or more bands pass from the posterior and upper part of the recessus pharyngeus to the Eustachian tube. These can be seen by post-rhinoscopy.

Fig. 2. The entire fossa is filled with a soft friable mass that is smooth and which can not be seen by the eye. The finger, however, sinks into and easily removes it. In this class, the recessus is deep and there is a large amount of tissue which bleeds almost as freely as at the average adenoid operation.

Fig. 3. The recessus is studded with irregular masses which may be scattered, though not large in amount. Objectively, then we do not have anything pathognomonic, as this condition may be associated with chronic secretory or suppurative otitis

media and locally it can be detected only by digital examination. Clinically, however, there is a very definite picture. These patients complain not so much of absolute as of relative deafness, i. e., their hearing fluctuates and is influenced by changes in weather, dust and physical conditions. They feel as though there is something over the affected ear or ears. There is tinnitus and referred abnormal sensations in the throat. The hearing test is normal for a long time. If they have an acute infection, it recurs constantly on the same side.

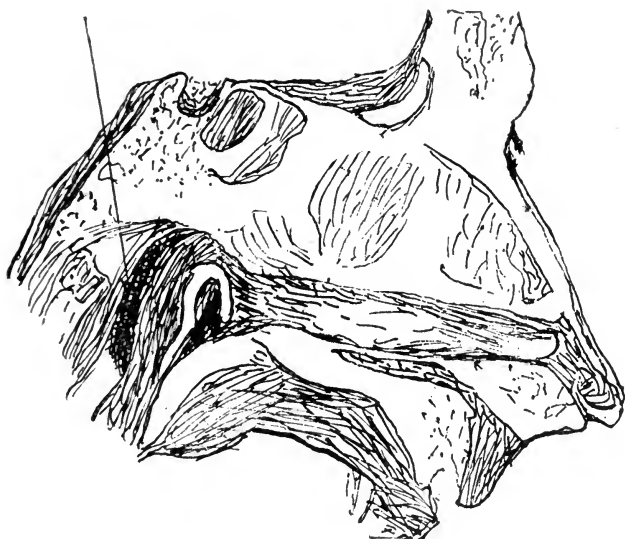


Fig. 2. Entire fossa filled with a soft friable moss which cannot be seen with a mirror.

The correction of abnormal conditions anterior to the vault does not protect the patient from subsequent attacks of salpingitis. These are the cases that have obtained temporary relief by the use of silver nitrate to the vault and catheterization or if there was a more acute condition, the Politzer bag. As in the nasopharynx, all palliative measures are being supplanted by surgical procedures, so here is one more reason for discontinuing the use of the much abused catheter. That the Eustachian tube will open physiologically and remain open if we can prevent or cure the inflammation of the tissues about

its orifice, I believe to be the trend of opinion among otologists. Those who hold this view find less indication for continued treatment by inflation. The influence of pathologic conditions of the recessus pharyngeus in continuing a suppuration of the middle ear over a long period is shown in Case 1 which was unmodified for four years by hospital and private care.

CASE 1. June 6, 1906. Miss M. C. Hospital. American, 16 years. Born in Massachusetts. Gives a history of chronic suppuration since childhood. During this time, the right ear has not been dry except for a period of two months, two years ago, while in the hospital for an adenoid operation. The left ear has discharged intermittently. She has been treated regularly at the hospital during this period and has had an ossiculectomy, besides an adenoid operation. The middle ear was cleansed carefully with a middle ear syringe. She is of more than average intelligence and has followed directions carefully at home. During the last two years, she has been under the constant care of one of our best men as a private case. She says that during that time there was no improvement that she could see. On June 6th, the fossae were cleared of a mass of soft degenerate tissue that bled as freely as at the average adenoid operation. Within twenty-four hours, the right ear became dry and has remained so. The left ear showed possibly two or three drops of pus. Although the right ear has been dry only two weeks, it followed immediately the clearing of the fossae after careful treatment had been ineffectual for years.

In Case 2 the effect on tinnitus and referred sensations in a chronic secretory ear is hardly less striking.

CASE 2. September 6, 1906. Miss H. T. Private case. American. School girl, 16 years. Born in Massachusetts. B.—O. M. Sec. C.—R. Tinnitus is continuous. Hearing fluctuates. Stuffy sensation in the ears.

Previous history.—Nose was cauterized and tonsils cut four years ago.

Examination.—Right tonsil, upper angle not clear. Left tonsil central mass present. Right Rosenmueller's fossa filled with soft granular tissue.

Treatment.—Rosenmueller's fossa freed and treated twice with iodo-glycerine.

Result—Tinnitus and abnormal sensations stopped in twenty-four hours and have not returned. There has been no reinfection of the right tube.

Although these two examples are hardly fair representatives of each class, they are by no means unusual especially in private cases that report for treatment until the pharyngeal mucosa has been restored to its normal function. The technic which I have employed to free the fossae is very simple and requires no anesthetic. Standing on the right, the left arm is placed around the neck of the patient and a wooden tongue

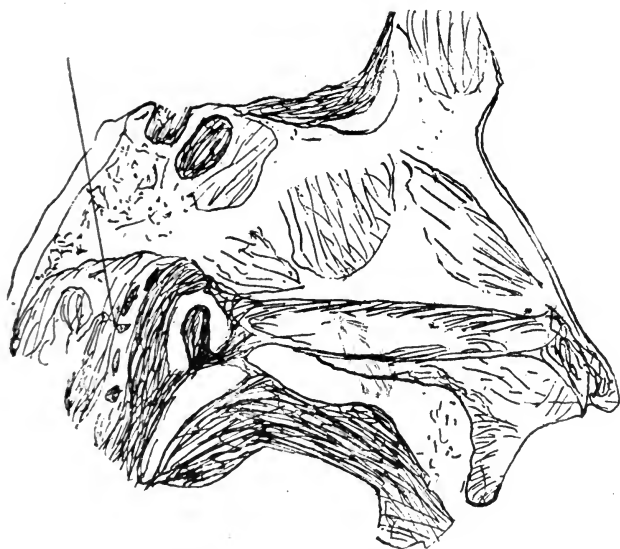


Fig. 3. Recessus studded with irregular masses.

depressor introduced between the teeth to protect the forefinger of the right hand, which is passed behind the soft palate. At this stage, I wait until the patient is assured that he will not be choked and respiration has become regular. This relaxes the soft palate and the finger passes through one and then the other fossa with very little discomfort. A simple spray of cocain can be used for the hypersensitive.

I have found degenerate tissue so often and its removal has been attended by such immediate results, that I do not feel justified in subjecting a patient to prolonged treatment without

digital examination of the fossae without reference to age. This conclusion has been reached after the examination of over one hundred hospital and many private cases extending over a period of four years. It is done immediately if they present the classical symptoms of stuffiness, fluctuating hearing, tinnitus and recurring unilateral salpingitis.

Some of the following cases were reported at a meeting of the Roxbury Clinical Record Club a year ago, before Doctor Brunk's paper was published. I offer this statement not with any idea of claiming priority, but to show that we have been working along the same lines and come independently to the same conclusions. Through the courtesy of Doctor Jack in the fall of 1905, I followed the history of twelve cases to note the effect, if any, on tinnitus. In early cases, this procedure was more immediately beneficial and lasting than any with which I am acquainted. This is shown in Case 3 where there were distinct bands which could be seen with the mirror.

CASE 3.—November 6, 1906. Mrs. G. H. B. Born in Nova Scotia. Repeated sore throats as a child but no sickness since. Comes for tinnitus especially after colds.

Examination.—Distinct bands in both fossae which can be seen with a mirror. A small amount of adenoid tissue on each lateral wall at the margin of the fossae, from which the bands start. Hearing normal. B.—O. M. Sec. C.

Treatment.—Bands removed under gas. Topical applications to the fossae.

June 12, 1907. No return of the tinnitus.

It is obvious first, that in freeing the fossae we not only remove a mass of degenerate tissue which keeps up a low grade inflammation, subject to acute exacerbations and reinfections that are communicated to the Eustachian tube, but, second, we deplete the engorged blood vessels and relieve stasis more effectively than by any topical application, and third, we allow deglutition to once more exert its physiologic action on the tubal muscles in normally ventilating the middle ear. Cases could be multiplied indefinitely but as the results follow in so short a time, the patients cease to report for observation.

CASE 4.—July 23, 1906. J. C., 28 years. Single. Born in Cambridge. Hospital. Teamster. B.—O. M. Sec. C. Hearing normal. Ears feel closed, as though there was a cloud over them, especially on a dull day. Better clear days. Tinnitus (steam) constant at night, intermittent during the day. B.

fossae filled with a soft glandular tissue, which bled very freely on removal. October 29 tinnitus gone. Hearing more constant. Still feels that one ear is closed and is relieved by inflation.

CASE 5.—January 15, 1906. Miss H. B. J. Hospital. American. Bookkeeper. 27 years. B.—O. M. Sec. C. Hearing normal. Nasopharynx clear except fossae which contain soft granular tissue. Left ear tinnitus like a whistle and is continuous. Right ear tinnitus like wind and is continuous.

Treatment.—Fossae freed with the finger.

Result.—Tinnitus not noticed except a very little at night.

In the following case prolonged treatment for a year of the anterior nares and vault had not given any relief to the tinnitus. This consisted of the removal of adenoids and surgical measures directed to the septum and middle turbinates followed by topical applications and sprays for the naso-pharyngitis. The tinnitus was so pronounced as to interfere with her work and sleep.

Treatment.—The fossae were freed digitally.

In response to a letter of inquiry, she replied in person and said that during the last year she had been free from symptoms.

CASE 6.—January 15, 1906. Mrs. C. H. R. 31 years. American. Housewife. Hospital. Hearing—right 2/25 watch, Dench 80, otherwise normal. Left 6/25, Dench 80, otherwise normal.

Nasopharynx clear except fossae. Right fossa has tense fibrous bands running from the Eustachian eminence to the posterior pharyngeal wall. Left small amount of glandular tissue. Tinnitus rushing in character rising and falling with varying pitch, and is continuous.

Result.—Tinnitus stops for long intervals and its character has changed to a humming sound. Hearing remains unchanged.

CASE 7.—Mrs. H. M. Housewife. Irish-American. Hospital. Hearing—right 18/25 watch, Dench 80, otherwise normal. Left 14/25 watch, Dench 80, otherwise normal.

Tinnitus low rumbling constant but worse following colds. Right fossa but little abnormal found. Left fossa glandular tissue.

March 6. Tinnitus better but not wholly stopped.

CASE 8.—Mrs. A. K. Married. 29 years. Hebrew. House-

work. Hospital. Tinnitus both ears, five months. Like engine. Intermittent. Hearing normal by test but fluctuates, not being as good damp days. When tinnitus is present, she sometimes has frontal pains on stooping. Left ear worse. O. M. Sec. C.

Examination.—Nasopharynx normal except fossa. Left distinct bands. Right small amount glandular tissue.

Result.—Ceased to report for treatment.

May 20. C. S. Single. Irish-American. 12 years. State ward. R.—O. M. S. C. for two years. During this time, he had been treated weekly at the hospital and twice daily at home. His adenoids had been removed but the ear discharged continuously for two years. Both fossae were filled with soft friable tissue which was removed and the discharge ceased in forty-eight hours.

CONCLUSIONS.

1. Pathologic amounts of lymphoid tissue are present in Rosenmueller's fossae in a large number of cases of chronic secretory and suppurative ears.

2. This cannot be detected with certainty by posterior rhinoscopy alone, even where a good view of the vault is obtainable.

3. In every chronic case there should be a routine digital examination.

4. Where much tissue has been found and removed, the process of healing should be watched that no fibrous bands form.

5. It is possible in a large majority of cases to predict the involved ear by the condition of the corresponding fossa.

6. Results where after-treatment is followed are particularly good in removing abnormal sensations, restoring uniform hearing without fluctuations in the partial or complete relief of tinnitus, and in the prevention of recurring salpingitis.

7. If directions are given to blow one side of the nose at a time and carefully, the affected tube is no more apt to be infected later than its fellow.

ABSTRACTS FROM CURRENT OTOLOGIC, RHINOLOGIC AND LARYNGOLOGIC LITERATURE.

I—EAR.

Some of the Lesions of the Middle Ear Due to Influenza.

GORHAM BACON (*N. Y. Medical Journal*, April 13, 1907). Since the epidemic of influenza in 1889, the number of serious ear trouble conditions has greatly increased. In the former year only twenty mastoid operations were performed at the New York Eye and Ear Infirmary, and in 1905, 535. Children seem to be more often affected. A sore throat is followed on the next day by a high temperature. Examination of the ear when affected shows a dull red bulging drum. The discharge following incision is wont to be sero-sanguinolent and very sticky. This with a high temperature and slight pain are quite characteristic symptoms. A general anesthesia for the incision of the drum, especially ether, he regards dangerous. Of late, he has been employing ethyl chlorid. He lays stress upon the character of the infection and refers to the probability that the infection may be different in the two ears when both mastoids are involved. Contrary to the classical teaching, he has seen a high continuous temperature in cases of sinus thrombosis. He believes in early operations if the temperature remains elevated after the drum has been incised, but calls attention to the fact that several incisions may be necessary. In his opinion, opening the normal sinus unnecessarily is a dangerous procedure.

Harris.

The Present Status of the Question of Progressive Spongification of the Labyrinthine Capsule (Oto-Sclerosis).

PIERCE, Chicago (*Archives of Otology*, Vol XXXVI, Nos. 1 and 2). By oto-sclerosis we designate a disease of the auditory apparatus, manifested clinically by loss of hearing, unaccompanied by changes in the tube or the tympanic mucous membrane, where tuning-fork examination shows prolonged bone conduction, a markedly negative Rinne with elevation of the lower tone limit. Pathologically there is early loss of mobility of the stapes by osseous ankylosis between it and the fenestra ovalis, together with the resorption of old and the re-

position of new bone, of lessened density, in the labyrinthine capsule.

Treatment is unavailing, but we may do much by reestablishing hope in the minds of the sufferers and in assuring them that though the process is slowly progressive they will have serviceable hearing for a long time. *Campbell.*

Dionin in Chronic Catarrhal Deafness.

RANDALL, Philadelphia (*Archives of Otology*, Vol. XXXVI, Nos. 1 and 2). Encouraged by the good service dionin has done in ophthalmology, in absorbing plastic exudates, the author has been employing it in a 5 per cent solution in the middle ear. After cleansing the nose and nasopharynx he places two drops of the dionin solution into the catheter and forces it as a coarse spray by means of the Politzer bag into the middle ear. *Campbell.*

Mastoiditis Occurring in Diabetic Subjects.

RICHARDS, New York (*Archives of Otology*, Vol. XXXVI, Nos. 1 and 2). From an observation of nine cases he has concluded:

1. That the mastoid invasion is somewhat characteristic. The acute otitis is frequently unaccompanied by pain. The bulging drum does not subside by repeated paracentesis.

2. The slow development of mastoid symptoms indicates a low vitality and a poor fight on the part of tissues.

3. The mortality is high. Six of the nine cases died in diabetic coma.

4. In plethoric adults of advanced years chloroform is the anesthetic of choice.

5. A successful issue depends largely upon the rapidity of operation and the short duration of the anesthesia.

Campbell.

Our Faulty Methods of Brain Localization in Intracranial Lesions Complicating Aural Diseases.

MACCUEN SMITH, Philadelphia (*Archives of Otology*, Vol. XXXVI, Nos. 1 and 2). Keen has pointed out that 15 years of experimentation in cerebral localization have taught us more than the previous 1500 years of careful observation and post-mortem examinations.

Pain in the head is the first symptom of brain abscess. At

first it is very severe, but later it becomes a steady, dull ache. The pain is increased if the cranium is percussed or pressure applied. Temperature is variable; when it is highest the pulse is rapid but the pulse becomes slower as brain pressure increases. Respirations are slow, deep and stertorous. Vomiting is reflex and independent of the ingestion of food. Dilatation of the pupil of the affected side with optic neuritis. In advanced cases stupor supervenes and the patient is aroused with difficulty if he can be at all.

A cerebral abscess of otic origin is located usually either in the temperosphenoidal lobe or in the cerebellum, in what Barker calls the "dangerous area;" that is, within a circle having a radius of 1 1/4 inches, which has for its center a point 1 1/4 inches above and behind the external auditory meatus. They are often found not directly in contact with their source of infection but with about one inch of healthy brain tissue intervening.

Campbell.

The Value of v. Stein's Symptom in the Diagnosis of Labyrinthine Suppuration.

EAGLETON, Newark (*Archives of Otology*, Vol. XXXVI, No. 3). Von Stein, in 1904, called attention to the presence of a peculiar inability of patients suffering from labyrinthine suppuration to execute certain delicate coordinate movements. Thus, with the feet placed together, especially when the eyes are closed, such patients cannot repeatedly jump with the degree of assurance of a normal person, but are compelled to catch themselves after one or two jumps, by throwing one foot out. In some cases this is so marked that they are unable so to jump even with the eyes open. Testing on the goniometer these patients showed inability to maintain the erect position at a very much more diminished angle of inclination than normally.

In an examination of between two and three hundred persons, which included all his cases of chronic otitis and many perfectly normal persons, the author draws the following conclusions:

1. A normal person jumps with his eyes closed, with a degree of assurance, not perhaps on the first attempt, but surely on the second or third.
2. Normal persons past middle life while jumping slowly but accurately for a few feet soon tire and so lose the accu-

racy of the movement, most probably from exhaustion.

3. The symptom is very valuable in chronic suppuration of the labyrinth, and particularly where the semicircular canals are affected it may be the only symptom.

4. The symptom is probably more marked in the early involvement of the labyrinth. It persists in some cases after the drainage of the labyrinth, but disappears in others.

Campbell.

The Prognosis of Operative Procedures on the Mastoid Process of Diabetic Subjects.

MEIERHOF, New York (*Archives of Otolology*, Vol. XXXVI, Nos. 1 and 2). Great stress has been laid upon the danger of general narcosis in those cases where the sugar is 3 per cent or more.

It is difficult to generalize, as each case affords its own peculiarities. Unfortunate results may follow where there is a low percentage of sugar and success may attend cases where it is high, even combined with the presence of acetone and diacetic acid in the urine, which latter is always regarded as the precursor of coma.

Naunny recommends giving large doses of sodium bicarbonate before and after the operation so as to lessen the danger from acidosis.

Preliminary dieting should be resorted to unless the urgency of the symptoms prevent it, so that we lessen the amount of the free sugar in the blood.

Avoid long anesthesia by operating rapidly and select an early morning hour after the physiologic fast, as diabetics do not bear well deprivation from food and drink for any length of time.

As the diabetic resistance to infection is very much diminished, one must operate early, before the patient has a high leucocytosis, if we would avoid courting danger.

Campbell.

The Origin of the Cells Found in the Deeper Layer of the Stria Vascularis.

SHAMBAUGH, Chicago (*Archives of Otolology*, Vol. XXXVI, No. 3). The stria vascularis occupies the outer wall of the ductus cochlearis between the attachment of the membrane of Reissner above and the prominentia spiralis below. The free surface of the stria vascularis is covered by a single layer of

epithelium with protoplasmic processes which penetrate the deeper strata and envelop, in part at least, the blood vessels. In the deeper strata are cells possessing much the character of epithelium, but a study of the embryo suggests their mesoblastic origin.

The author's studies of the development of this structure in the embryo of the pig brings out the fact that the basement membrane separating the epithelium from the connective tissue persists until the formation of the reticulum of the second stage is well advanced. The position occupied by this basement membrane is not directly beneath the surface layer of epithelium as it would be in case the reticulum was derived from the underlying connective tissue. The basement membrane is found passing through the midst of the cells forming the reticular layer and at a considerable distance from the surface layer of epithelium. This position of the membrane proves definitely that the cells forming the reticulum are derived in part from the surface layer of epithelium and in part from the underlying connective tissue.

The blood vessels of the stria are placed directly beneath the surface layer of epithelium and as soon as formed are enveloped in protoplasmic processes from the surface layer as are also the cells around the blood vessels, hence we are justified in assuming that the stria vascularis represents a true vascular epithelium.

Campbell.

A Case of Mastoiditis Complicated by Thrombosis of the Left Lateral, Petrosal and Cavernous Sinuses. Operation. Report of Autopsy.

LEWIS, New York (*Archives of Otolaryngology*, Vol. XXXVI, Nos. 1 and 2). A man, aged 22, was admitted to the hospital with symptoms of pyemia. Three days later, otorrhea and pronounced tenderness over the left mastoid and internal jugular vein were detected.

On operation, after removing a very hard cortex, the remaining portion of the mastoid including the greater portion of the inner table was found destroyed, the sigmoid sinus was obliterated from a little beyond the knee almost to the bulb. The sinus was curetted as far as the torcular but the flow of blood was not free. Hemorrhage was controlled by gauze tampon.

The internal jugular vein was then removed but no clot found in the vein. Bacteriologic examination showed a strep-

tococcus infection of the vessel walls. Five days later there was evidence of cavernous sinus thrombosis and his condition was so bad that it was determined to explore the right sinus beyond the torcular; this was done by removing the bone covering the left lateral sinus as far as the torcular and passing the curette to the opposite side. No clot was found, nor was there a free flow of blood. The patient died one hour after being returned to the ward.

Autopsy revealed a mild seropurulent leptomeningitis over the vertex of both hemispheres. A small white clot was found in the right lateral sinus near the knee. A purulent thrombus was present in the left inferior petrosal and cavernous sinuses. All the small veins collateral to the left lateral sinus were thrombosed. The left sphenoidal cell was filled with muco-pus.

The heart was soft and flabby and the pericardial sac contained 6 ounces of clear amber fluid. Dense white thrombi were found in both auricles and these extended through the valves into the ventricles. In the right auricle there was additional recent red clots.

The left pleural cavity contained a large quantity of fetid purulent fluid and abscess cavities were scattered through the corresponding lung.

The immediate cause of death was cardiac thrombosis.

Campbell.

Report of a Case of Leptomeningitis With Onset of Symptoms, Sixteen Days After a Radical Operation, the Infection Reaching the Meninges Along the Facial Nerve.

SPRATT, Minneapolis (*Archives of Otology*, Vol. XXXVI, Nos. 1 and 2). A man, aged 45, had an acute otitis media suppurativa during the course of which attack there appeared a partial facial paralysis.

Four months after its inception, on account of mastoid pain and edema, the radical operation was done and foci of infection were found from the root of the zygoma to the mastoid tip. A Körner flap was made and the large bony cavity was lined by a Thiersch graft. The posterior incision was closed.

For 16 days the post-operative course was most favorable; then he began to have a severe headache, had a distinct chill and high temperature. He appeared dazed and answered questions slowly. Examination of the fundi was negative.

The operative wound was reopened and the cavity found lined with epithelium except, that corresponding to the mas-

toid tip. As exposure of the dura over the cerebellum and temporo-sphenoidal lobe presented no evidence of infection, and as the sinus wall was thin, soft and dented on pressure and the meninges showed but slight infection, exploration of the brain was thought unadvisable.

On autopsy the auditory and facial nerves at their entrance into the internal auditory meatus were surrounded by a mass of yellow purulent exudate which extended upwards in the sulci of both sides to the longitudinal fissure. The sides and superior surface of the cerebellum showed the same condition. It was clear that the infection had spread from the internal auditory canal to the outer surface of the brain and from there to the base. The medulla on its inferior surface was covered with exudate. The pneumococcus was found in sections and smears.

The localization of the exudate about the internal auditory meatus; the period of apparent recovery, followed by the sudden onset of symptoms, sixteen days after operation; the healthy condition of the bone and dura about the field of operation, all point in a very definite manner to the fact that the infection had reached the meninges by extension along the auditory nerve.

Campbell.

I—On the Significance of the Operative Findings for the Diagnosis of Purulent Inflammation of the Labyrinth During Exposure of the Middle Ear Cavities.

II—Indications for Opening a Purulently Affected Labyrinth.

V. HINSBERG, Breslau (*Archives of Otology*, Vol. XXXVI, No. 3). The parts to which particular attention must be directed are the two windows, the promontory and the horizontal semicircular canal.

The round window is inaccessible to direct examination by the eye and so long as the destruction is limited to the region of this window and does not extend to its bony coverings it is unrecognizable.

Fistulae in the promontory are visible after the middle ear cavities are fully exposed where we have careful hemostasis and intense illumination. Careful use of the probe usually tells us to what extent the destruction extends into the interior of the labyrinth and whether sequestra are situated in the depth.

A perforation in the region of the semicircular canal may be easy or difficult to recognize. It is easy when the semi-

circular canal, in its gross appearance unchanged, presents a distinct furrow along the prominence.

According to Jansen and Friedrich the presence of a dark line at the level of the semicircular ridge, meaning a translucent lumen, is generally the evidence of extensive disease of the labyrinth.

There are unquestionably cases of semicircular fistulae where the infection has remained localized to the immediate neighborhood and we have circumscribed labyrinth disease. Here though there may be severe disturbance of equilibrium yet very good hearing may persist.

The operation for opening a purulently affected labyrinth is always necessary when an exact functional examination (deafness and symptoms of irritation or defect of the vestibular apparatus) and the conditions found on exposing the middle-ear cavities show us that extensive disease of the labyrinth is present.

If the functional examination and the operation point to circumscribed disease of the semicircular canal or if at operation a labyrinth fistula cannot be definitely proven, it is best to wait and to operate secondarily if symptoms of irritation do not quickly disappear. If an endocranial complication is present or threatens, the diseased labyrinth must be opened at once.

In a case where an apparently isolated fistula of the semicircular is left undisturbed at the time of exposing the middle-ear cavity, one must watch carefully for any symptoms pointing to extension of the disease in the inner ear. These are primarily the symptoms of irritation, vertigo, nystagmus and diminution of the hearing which was preserved before operation. In such a case broad exposure of the labyrinth cavities must be undertaken.

In case of a movable sequestrum in the labyrinth it is extracted by enlarging the fistulous opening. *Campbell.*

The Auditory Organ of the Japanese Dancing Mouse as a Type of Deaf Mute Animal

F. H. QUIX (*Tydschr. v. Geneesk.*, July 7, 1906) bought two pairs of dancing mice and raised ten more; he observed them and experimented with them and examined microscopically the auditory organs of five individuals of three generations.

Physiologic observation has taught:

1. The absolute deafness (Cyon found reaction for only some high tones with a few mice).

2. The dancing movements.

3. Absence of symptoms of dizziness under circumstances, where normal animals show them.

4. Less dexterity in performing movements and equilibrium tricks, as is found with normal white mice.

Quix observing the movements of the dancing mice found besides the dancing motions a heavier and broader gait than normal white mice have. He could not be convinced that they were unable to move in a straight line. When white mice are brought into relation with a rotating instrument, then every reaction of the rotating motion is absent in the dancing mice, while the white mice suffered from dizziness, compulsory movements and vomiting. Examined as to their equilibrium skill on a small bridge, they were found far behind the white mice. Their muscular force was also examined after Zoth's method and found decidedly less than that of white mice (pulling force per gram body-weight: for male white mice 2.2, for female white mice 2.1, for female dancing mice 1.75).

Some deaf mutes never learn to swim; viz., where the function of the static organ has suffered. The broad, heavy gait and the awkwardness in climbing indicate deficiency in the regulation of the equilibrium in the dancing mice. Their behavior in water is very different from the white mice, which are excellent swimmers and which know how to use a saving plank, while the Japanese mice sink immediately and do not reach the surface; they lose power of orientation and have to be soon taken out to prevent drowning. Well cooled boiled water should be used to prevent pneumonia.

The hearing of both kinds of mice was compared. It was found that the white mice heard from e^2 — c^8 . That the mice may still hear tones below e^2 cannot be excluded, although they do not react with a movement of fear. It is interesting to note that the upper limit as well as the sensitive zone for white mice lies about one octave higher than for man. Quix did not succeed in exciting a reaction to a sound with his dancing mice. He examined all octaves with whole tones, so he had to declare them absolutely deaf.

For histologic study the two auditory hearing organs were

left in situ with the base of the skull, which very much facilitates the orientation. Serial sections of white mice were made for comparison, in the same way.

The organs of the first three examined from the first and second generation show more or less the same changes. The external auditory canal and middle ear are normal. As to form the inner ear is normal. The changes are in the nerves, ganglia and sense epithelium. The ganglion cells in the ganglion spirale and scarpae are diminished, the nerve fibres for the different maculae and the organ of Corti in the different convolutions have a smaller dimension, the size of the different ganglia cells differs much more, than in the ganglia of white mice. To make sure that we have to deal here with a hypoplasia, Quix compared other ganglia, the ganglion geniculi facialis, gasseri, oticum, etc., which did not differ perceptibly from those from white mice. The sense cells in the organ of Corti are diminished, the other elements of this organ being normal. Sections are found in which all sense cells are absent, others, in which the inner cell is absent, while the outer one is present, diminution in the number of ganglia cells and nerve fibres is found in the corresponding part of the ganglion spirale. But the two deviations are not parallel. The organ of Corti may be found without sense cells with a normal looking ganglion spirale. Quix considers this finding important for the pathogenesis of the deviation. The stria vascularis is absent or poorly developed; the cubical epithelium is replaced by a layer of flat epithelium cells, while the blood vessels are absent or occur sporadically. In the maculae of the sacculus and utriculus the number of hair cells is diminished; this diminution is doubtful in the cristae of the semi-circular canals. Otoliths were found everywhere.

The fourth and fifth dancing mice belong to the third generation and show changes of more pronounced degree. The fourth mouse has the changes symmetrically: the N. cochlearis contains only a few nerve fibres, so that a big cavity remains in the modiolus; only few of the cells of the ganglion spirale are found, while only few fibres coming from these ganglion cells go the organ of Corti. Of this organ only the pillars are present; the specific sense cells (cells of Corti) are entirely deficient, while in the place of the specific supporting cells (cells of Deiter and cells of Hensen) irregular, flat or cubic epithelium cells are found. The membrane of Corti has

shrunk and has grown together with the membrana vestibularis. The stria vascularis is entirely absent; in its stead are irregular flat cells and here and there a mass of large bubble-like cells, which fill for a great part the ductus cochlearis. The sacculus shows important changes, the lateral wall has coalesced with the medial, the otoliths are absent, while the epithelium of the macula is replaced by a layer of flat irregular epithelium cells, which are unciliated; only a few cells of the ganglion, which provides the macula sacculi with nerve fibres are present. The rest of the static part of the labyrinth is as in the first three mice.

The changes in the cochlea of the fifth mouse are the same as of the first three mice and symmetrical; those of the static organs are asymmetrical. In the left ear the lumen of the sacculus is obliterated, the macula is destroyed, the otoliths are entirely absent, while in their place a pathologic tissue is found, consisting of a thick layer of dense connective tissue. In the right ear the sacculus corresponds with that of the first three mice, while in the left ear the utriculus corresponds with them. The right utriculus shows a new deviation, partly obliteration of the inferior part; the macula is about normal. The bony septum between external and posterior semicircular canal is absent in the right ear, the membranous septum being present.

Only for the fourth mouse the absolute deafness can be entirely explained from the histologic findings, since in the whole cochlea no sense cells in the organ of Corti are found. Quix must yield the existence of tone rests, if we accept the theory of Helmholtz. A proof against this theory can be hardly found, because the stria vascularis in all circumvolutions is absent, or destroyed, and it has most probably a great significance for the hearing. The absolute deafness can be explained, when one admits that the entire basillar membrane or a very large part of it is necessary for the perception of one single tone, through the abnormal patches on the entire membrana basillaris, even excepting the destruction of the stria vascularis.

The disturbances of the equilibrium can be explained on the basis of the changes found in the static labyrinth. The still remaining rests of this partly degenerated organ can explain the individual differences in the regulation of the equilibrium, which are undoubtedly found in the mice.

The changes found demonstrate a congenital defect, as the disturbances of the equilibrium exist from birth and do not change with age, also the symmetrical appearance (only the fifth mouse differed) and the absence of symptoms or rests of inflammation. Embryologic studies are necessary for a complete conception.

Continued breeding shows that the deviations may change in character and increase in extent. *Blaauw.*

The Treatment of the Secondary Inflammation of the Labyrinth.

H. BURGER (*Tydschr. v. Geneesk.*, July 21, 1906) mentions how, in recent years, the interest in this complication has increased, as the radical operation showed how frequently it occurs. It taught us also its importance as connecting link between the middle ear inflammation and the fatal affection within the cranium. Experience showed, that the inflammation of the labyrinth often healed after a radical operation—however, very often this was not the case. Even in later years, the radical operation has been charged with sudden reviving of the labyrinth inflammation with rapidly fatal meningitis.

Burger saw at his dispensary a 12-year-old girl, November 30, 1905; her face was twisted for a fortnight, which was accounted for by a fall three days previous. The right ear had discharged for five years. There was complete rightsided facial paralysis and on both sides a purulent, stinking otitis media with deep granulations. The under part of the right mastoid was sensitive on pressure; no swelling. Two days later Burger performed the radical operation. There was now a distinct painful swelling of the right mastoid region. The denuded planum mastoideum looks bluish; it was opened with Doyen's drill, and then with the chisel; it was diploetic, very plethoric; the small antrum contained granulations and stinking pus. In the aditus ad antrum, at the position of the horizontal semicircular canal, the bony labyrinth capsule had a bowl-like carious defect with a diameter of about four millimeters in which there were granulations of dirty-grayish color. The tympanic cavity was full of granulations; these were carefully removed with the curette as those from the Eustachian tube. The bony posterior wall of the outer ear canal was removed. Malleus and incus, both sound, were removed;

the stapes was not seen. Finally the granulations were removed with great care from the labyrinth wall with curettage. The membranous wall of the auditory canal was cut conforming with the long incision in the direction of the canal. The cavity was very loosely tamponed with little pieces of iodoform gauze, and the wound behind the ear kept open. Bandage. The operation lasted an hour and a quarter. Next morning temperature 37.3 degrees; complaints of headache and pain in the neck; evening temperature 39.3 degrees. The mother states at this time that the girl had been sick for a fortnight before the face had become drawn; she had had fever and when she was up and around she would fall; nausea was present and she vomited every thing she ate. This passed off and the face then became drawn. Next day the temperature was the same, pulse frequent (114 to 128), headache. The tampons had a bad odor, fetid pus in the neighborhood of the labyrinth defect; pupils equal and react well, other reflexes normal; the papillae nervi optici were hyperemic with somewhat enlarged vessels. The skin was hyperesthetic. In the evening the headache greatly increased and the child screamed the whole night. The third day the temperature was 37.6 degrees in the morning and 40.7 degrees in the afternoon; pulse small, irregular, very frequent (174), the skin very hyperesthetic, knee jerk increased. The child screamed on account of the headache, lying with the head bent strongly backward; distinct stiffness of the neck present. The left eye was closed, but can be opened; the right eye was half open by reason of the facial paralysis; the right pupil was larger than the left; eye motions normal. Although the diagnosis of leptomeningitis purulenta could not be doubted, with curette and chisel the writer enlarged the labyrinth defect as far as the vestibule; as the space was insufficient and the facial nerve was not to be saved, he enlarged the opening downward as far as in the oval window, where no stapes was found. The vestibule was now visible; it was full of granulations, which were removed. The posterior cranial fossae was now opened through the posterior wall of the mastoid process, internal to the lateral sinus. Thin fluid with some pus was evacuated from under the dura; then the dura was incised as far as the bony defect was made, after which colorless fluid with very fetid yellow pus flakes flowed away; the visible piece of dura was excised, after which a soft, edematous mass pro-

truded. A piece of iodoform gauze was put between bony wall and brain membrane. Patient was more quiet, during the night pulse less frequent, regular and stronger; temperature in the morning 40.5 degrees, but went down to 39.2 degrees at 4 o'clock. The general condition continued improving, with no more headache, the hyperesthesia of the skin had disappeared, likewise the inequality of the pupils and the stiffness of the neck. On changing the bandage no more fetor was found. However, the temperature again arose during the evening (40.6), the child became delirious during the night and died early in the morning. Post-mortem showed leptomeningitis serocellularis of the entire convexity of the brain; posteriorly a good deal of thick, green pus between the hemispheres, and a number of the very small circumscribed pus foci in the brain substance at the right side.

The question of the right treatment of the secondary inflammation of the labyrinth is of great practical importance.

In many cases we cannot diagnosticate a labyrinthitis with certainty. All symptoms except deafness may be absent in scarlatinal panotitis, with sequestration and expulsion of a large part of the entire labyrinth, such as acute disturbance of equilibrium, uncertain gait, dizziness upon movement of the head, nausea and vomiting, nystagmus. Labyrinth attacks of more or less seriousness (nystagmus, subjective sound perceptions, dizziness and the accompanying vomiting) may entirely disappear. But even the attacks of labyrinth excitation, established with certainty, do not demonstrate the *purulent character* of the affection. Burger diagnosticated twice a quickly originating and persistent labyrinth deafness in an acute middle ear inflammation, without this complication interfering in the least with the course of the otitis media. The most typical of the symptoms of labyrinthitis, dizziness with vomiting and nystagmus, may also be found in a cerebellar abscess, secondary to the middle ear inflammation; in a large part of these cases the labyrinth also is diseased.

Practical experience has taught, that if no really dangerous symptoms exist, a large opening of the labyrinth cavities should not be made at the time of the radical operation. Burger inclines against enlarging a fistula of the labyrinth; if the labyrinth is not opened liberally, it is better not to touch a fistula present.

All writers agree that an indicatio vitalis forces the opening of the labyrinth. This comprises all the cases, where the

labyrinth inflammation is coupled with intracranial complications. To open the extradural or cerebellar abscess without attacking the primary focus would be very irrational. As to the purulent meningitis, the most frequent intracranial sequence of labyrinth inflammation, Burger considers it a duty in certain cases to incise a normal looking dura mater, although the chance for a cure may be very small. In case the meningeal infection arises from the semicircular canals, Hinsberg's suggestion, to uncover the place freely, where the infection of the meninges is brought about, can be followed, if according to Jansen an opening is made in the roof and posterior plane of the pyramid of the petrosus, sacrificing a part of the semicircular canals. If a fistula is found in the radical operation, then the discovery of pus, especially when it is under pressure and after removal returns from out the opening of the fistula, may lead to a direct opening of the labyrinth, rather than when a dry fistula is found in the lateral semicircular canal—the most frequent occurrence. In this last case the result of the middle ear operation must be waited for, and if no serious symptoms of labyrinth excitation are present, or they have passed off, then Burger prefers to leave the labyrinth alone. Labyrinth suppuration with serious labyrinth symptoms permits the opening of the labyrinth, because the indication depends a good deal on the surgeon, as one who does not sufficiently understand the topography of these parts should leave the labyrinth untouched under all circumstances.

Burger likes to wait for the results of the middle ear operation in cases of nerve deafness and labyrinthic attacks without labyrinth fistula. If the labyrinth symptoms remain serious or increase, then the opening of an apparently intact labyrinth capsule may be allowed, the personal factor of the surgeon playing here an important part. For the rest Burger agrees with Jansen.

All agree that the possibility of a postoperative meningitis should not contraindicate radical operation for a chronic middle ear suppuration. The existence of labyrinth symptoms, constantly or with remissions, is an urgent warning not to prolong the conservative treatment too long. As the labyrinth suppuration may be present, great care is needed in performing the radical operation. Only very sharp chisels should be used and firm strokes must be avoided, the smallest bone splinters must be carefully removed during the whole opera-

tion, and the bone cavity carefully wiped by the surgeon himself under strong illumination and careful but not forceful stopping of the bleeding. The surroundings of a labyrinth defect should be left untouched, rather leave a few granulations in the neighborhood. The defect should not be probed. A sequester should not be removed, if not loose. For the after treatment it is better to leave the wound behind the ear open. Stiff tamponing should be avoided and, in general, powder treatment without tampons is preferable. The route of the infection should be followed; in suppuration of the oval window, the stapes, if present, must be removed and, if possible, the window enlarged with a very narrow chisel, downward, not upward, where the facial is in the proximity. The lumen of a defective semicircular canal must be followed as far as the vestibulum; here the ground is limited anterior by the facial canal, superiorly by the dura mater; a low position of the middle cranial fossa may make it very difficult to go through these two into the vestibulum. In those cases Jansen goes through the semicircular canals towards the posterior side of the petrous pyramid and from here into the vestibulum. Jansen's method must be followed if secondary inflammatory processes exist with the labyrinth suppuration in the posterior cranial fossa, which have to be attacked. *Blaauw.*

II—NOSE AND ACCESSORY CAVITIES.

The Accessory Sinuses of the Nose From the Rhinologic Standpoint.

CHARLES W. RICHARDSON (*N. Y. Medical Journal*, March 2, 1907) is of the opinion that catheterization of the frontal sinus is possible in a large majority of cases, and usually without the necessity of removing any of the middle turbinate. He attaches great importance to the value of transillumination in connection with the diagnosis of the disease of the antrum, but has found it unreliable in the case of the frontal sinus.

Harris.

Ocular and Orbital Symptoms in Diseases of the Sphenoidal Cavity.

SCHROEDER, Erlangen (*Archives of Otolaryngology*, Vol. XXXVI, No. 3). The bony partition of the sphenoidal sinus is not thick and very frequently there are congenital defects, so that its periosteum or mucous membrane directly meets the periosteum of the orbit, hence it is apparent that an inflammation of one cavity can invade the other easily.

There is close relation in the nutrition of these areas through the lymph vessels, the ethmoidal and the ophthalmic arteries; also the fact that the ophthalmic vein receives venous blood from the nose and its accessory cavities.

Eversbusch repeatedly observed that the onset of sympathetic inflammation of the second eyeball was preceded by a marked swelling of the mucous membrane of the nose which remained regularly localized to the corresponding side of the nose and then extended to the other side. After removal of the primarily diseased eye, among the prodromal signs of an involvement of the other eye was a swollen condition in the nose. He even regards the findings in the nose as an indicator to determine the timely enucleation of the diseased eyeball.

Prognosis is always serious on account of the proximity of vital organs. A perforation through the upper wall may be followed by meningitis and thrombosis of the cavernous sinus. A necrosis of the lateral wall may cause blindness through pressure on the optic nerve or by perineuritis, exophthalmos, retrobulbar abscess with consecutive meningitis.

Treatment consists in a broad opening with removal of all diseased parts, preferably by the endonasal method.

Campbell.

The Accessory Sinuses of the Nose From an Ophthalmologic Standpoint.

WILLIAM CAMPBELL POSEY (*N. Y. Medical Journal*, March 2, 1907). Sphenoid and ethmoid diseases may excite retrobulbar inflammation of the optic nerve of varying degrees of intensity and paresis and palsies of the ocular muscles. Edema of the lids is a frequent index of the existence of sinus diseases. Further than these conditions of the eyes, he does not believe that the nasal sinuses are to be held responsible. He deprecates the extravagant view of some ophthalmologists who claim that the relation between the nose and the eyes is a still more intimate one. The conditions of the nose often are obscure and call for the examination of one who is a specialist. Even in this case, the problem is not always an easy one, as the condition in the sinus may be only one of simple inflammation. He does agree with Haskell, of Boston, who has found a class of refraction cases which he has cured by operation upon the nose. In conclusion, he speaks of several cases of necrosis of the superior maxilla which he has

seen in children. The abscesses have pointed in the orbit and in the mouth. He suggests the possibility of the infection coming from dirty nipples of the mothers. *Harris.*

An Artificial Dermoid Cyst.

H. BURGER (*Tydschr. v. Geneesk.*, July 28, 1906) was consulted by a man, who wished to improve his nose by a paraffin injection. He fell on his nose at the age of 10; later the bridge of the nose gave way and the nose became distorted. He was operated four years ago by means of a plastic from the forehead, after Koenig's method, in which a skin bone flap from the forehead is turned downward, after the nose is first made movable by a transverse incision at the deepest portion of the saddle. Healing went on smoothly except a small place over the root of the nose, which remained secreting for a long time. After healing slowly, a swelling between the eyes appeared, which increased till it burst at the right side. White "matter" escaped and the swelling in the main disappeared. But it reappeared and now each few weeks patient has to prick it on the right side of the nose; the condition cosmetically is far worse than before. A year after the first operation a second one was done without success. Burger found a soft swelling, of the size of a marble, right above the nose with a normal skin. At the right side was a small patch of thin skin. Directly under the swelling the nose seemed much sunken, and the end tipped up. The nose was slightly oblique, but otherwise the changes were immaterial. No evidence of inflammation was present. The sac was removed under narcosis and found to contain a white, fatty, thick mass, microscopically showing fat and epidermis cells. The wall was formed chiefly by connective tissue, with changed flat epithelium, in places a large number of acinous glands and a few hairs in the wall. Macroscopically no hairs were visible, and the entire wall was smooth and white. It is evident that a skin flap from the forehead was turned toward the nose at the first operation and that the epidermis came under the flap and the skin grew together over it, helped by the temporary suppuration. Through the secretion of sweat and fat a sac must have formed lined partly or entirely with epidermis.

After the operation paraffin injection was not required, because the cicatrix on the depressed place was rigid and immovable and directly over it the tissue was very loose and the skin movable. *Blaauw.*

ANNALS
OF
OTOLOGY, RHINOLOGY
AND
LARYNGOLOGY.

VOL. XVI.

DECEMBER, 1907.

No. 4.

XLVIII.

TUBERCULOSIS OF THE MOUTH.*

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Tuberculous lesions of the mouth include those involving the lips, cheeks, gums, hard palate, soft palate, tongue, teeth and alveolar process. Tuberculosis of the pharynx is not included in this paper, although it is difficult to draw the dividing line. So large a subject as tuberculosis of the tonsils forms a subdivision of pharyngeal tuberculosis and is also omitted from this discussion, although it will be necessary for purposes of comparison and illustration to touch upon all lesions of tubercular character ordinarily seen by what is known as pharyngoscopy. It is comparatively rare to see isolated lesions involving but one of the structures included in the mouth, and it is the author's belief that such rare cases form a class by themselves, possessing the same general

*Read at the meeting of the American Laryngological, Rhinological and Otological Society, May 31, 1907.

characteristics that other tubercular lesions of the upper air passages do, but marking a distinct difference in course and prognosis.

A careful review of over 200 references, abstracts of which will appear in a subsequent paper, impresses one with the rather large number of tuberculous lesions of the mouth which have, from the time of Thomas' article¹, 1839, been reported. The largest number, however, have appeared within comparatively recent years, and I wish to mention especially the early articles of Bosworth², DeBlois³, Delavan⁴. Yet when one analyzes the extensive literature, he must be struck by the general inaccuracy in diagnosis and the lack of appreciation of distinct variations and differences in these lesions, differences which are of special importance in etiology and prognosis.

Forms.—Tuberculous lesions may manifest themselves in different forms, according to pathologic changes, according to mode of development and according to their clinical course.

First, the various pathologic alterations seen are nodular infiltration, superficial ulceration, deep ulceration, perforating ulceration, necrosis of bone, chronic abscess and tumor.

Second, according to the mode of development, we have two forms, "endogenous," and "ectogenous" (Grunwald⁵), which corresponds to the general classification of Hollander⁶ into "descending" and "ascending."

Third, according to clinical course, we may have "malignant" and "benign."

Clinical observation confirms this classification. The "ectogenous" or "ascending" form, that which may be designated as the inoculation variety or purely local, represents the less active, sluggish or "benign" type, while the "endogenous" or "descending" variety, that which represents infection through blood and lymph streams, through miliary deposits or infection from within, corresponds to the more active, virulent, "malignant" type.

Etiology.—It is a well established fact that tuberculosis of the upper air passages, and particularly of the mouth and pharynx, is more commonly found in males than females. This leads to the question of how far local irritation of the mouth and possibly slight injury of the mucous membrane enter into the causation of tuberculosis. This also raises the question as to the existence of primary tuberculosis of these structures. There are innumerable cases upon record in which

the only demonstrable lesion is that localized in the mouth and especially upon the tongue. In these cases, the history of ulceration following a slight injury to the mucous membrane, which although nothing more than an abrasion to begin with, refused to heal, should be fairly conclusive proof that the abraded surface was an easy portal for infection in which tubercle bacilli became lodged, the characteristic tubercular process following. On the other hand, assuming that there is a necessary vulnerability without which tubercle bacilli may be innocuous, leads to the belief that there already exists in individuals developing such a localized tuberculosis, another and primary focus of infection. Auguy⁷, 1895, and others since then have stated that the most frequent mode of infection is through the blood current. Walsham⁸ has shown the importance of the lymphatic system in the development of tuberculosis, especially with regard to the frequency with which infection may be conveyed to the bronchial glands from above, through the adenoid tissue in the throat, including the pharyngeal and faucial tonsils. It has been unquestionably demonstrated that tuberculous infection may invade the system through the tonsils without producing any alteration in the tonsils themselves. It has also been shown by Cook⁹ that the teeth, especially when diseased, form excellent foci through which infection may be carried to the adjacent lymphatic structures. The question, therefore, becomes an extremely complicated one, especially when we remember that post-mortem examinations have revealed the presence of foci of tuberculosis in the lungs which were not suspected and could not be demonstrated ante mortem. It seems reasonable to conclude that although local or systemic causes exist, infection may descend through the lymphatic system to the bronchial glands, invade surrounding structures and be carried by the blood current to such parts as the tongue, the lips, the gums or the hard palate, and that additional local irritation or trauma, however slight, may determine the outward manifestation of tuberculosis in these regions. Ragged, sharp or decayed teeth, extraction of teeth, poorly fitting dentures, biting the tongue, injury from pins or other sharp bodies in the mouth constitute the more common local causes. In fact when we consider that the mucous membrane of the mouth, although more or less constantly bathed in sputum laden with tubercle bacilli in tuberculous individuals, develops tuberculous lesions

but rarely, one must admit that there exists a special protective agency. This protective agency obtains so long as the surface of the mucous membrane is not altered either by traumatism or pathologic changes. Once this protective agency is in a measure diminished, local tuberculosis may manifest itself. The more frequently one sees tuberculosis of a given organ, the more reasonable it is to presume that the infection of that structure came about through the blood or the lymph current. The less frequently certain structures are involved, the more reasonable to suppose that some local cause must operate to overcome its invulnerability. This thought is supported in the classification of Grunwald, Walsham and others, as well as in the clinical history. It is a recognized fact that the so-called primary lesions of the mouth are more sluggish and less malignant than the secondary varieties, the latter developing through blood and lymph current in an organism abundantly attacked by the tuberculous process. This thought is further borne out by the slow and comparatively non-malignant affections of the gums, the hard palate, the lips, the cheeks and the tongue, and the rapidly progressing, actively malignant course of tuberculosis of the pharynx and tonsils.

Subjective Symptoms.—Tuberculous lesions involving the tongue, the lips, the gums, may exist for some time before the patient is aware of their presence. Even ulcerating lesions may develop to a considerable extent before attracting attention. In this respect these lesions differ from those involving the pharynx and larynx. The earliest manifestation is a sense of slight soreness or burning, marked particularly when the diseased surface is irritated by contact with food. Soreness may become decided pain, more especially when the lesions involve the tongue. When seen upon the hard palate or gums the pain rarely becomes severe, differing from the usual intense pain of tuberculous ulcers. There is localized swelling and slight increase in the secretion of the parts, which becomes viscid, grayish white or dirty. A slight odor is often apparent although rarely becoming offensive. Even when the ulceration has gone on to marked necrosis of the underlying structures, the odor that is at times discernible may be attributed to the general cachexia of the individual rather than to the local lesions. Glandular involvement may or may not be present. I have seen it in very early lesions and have failed to discover any enlargement of cervical glands in cases far

advanced. When it does exist it is rarely painful. In tuberculosis of the tongue, lips, gums or palate, the general symptoms of the patient are comparatively slight except in those cases which develop in the course of severe general infection, such as is found in a miliary process. These severe cases are usually marked by the rapid development of lesions extending to the soft palate, the tonsils and the surrounding pharyngeal structures, when dysphagia and odynphagia of severe type, high temperature, rapid pulse, marked emaciation and exhaustion may be added to the symptoms.

Objective Symptoms.—Excluding those isolated instances of tumor and abscess¹⁰, there is apparent to the most casual observer a definitely uniform local lesion. The general appearance is that of a pale, superficial ulceration without inflammatory areola, edges irregular in outline and beveled or undermined, tending to spread laterally, not deeply. A viscid, dirty white secretion covers the ulceration, which when cleaned away brings to view a more or less nodular appearance. Scattered irregularly over the surface of the ulceration and upon its margins are seen small, red, soft granulations, interspersed with *pin-head spots of yellow or gray*. These yellow spots, the spots of Trelat¹¹, may be seen also upon the mucous membrane adjacent to the ulceration.

Case I, Figures 1 and 2, demonstrates very early as well as moderately advanced tuberculosis of the gums. This patient, aged 26, was first seen in December, 1906, having been referred by Dr. Bergtold. He had had pulmonary tuberculosis one year. In August, 1906, the gums became sore. There was also some soreness in the nose and larynx, the latter inducing painful and difficult swallowing. A typical tuberculous ulcer was seen upon the left surface of the nasal septum. The larynx presented pale infiltration of both arytenoids with numerous small ulcers and grayish deposits. The gums over the first bicuspid on the right side of the upper jaw and over the first and second bicuspid right side, lower jaw, were seen to be covered with small reddish nodules, very superficial ulcers and a few pin head yellowish spots. The typical tuberculous appearance of a very early lesion was readily demonstrated. Fig. 1. Upon the lingual surface of the gums of the first and second molars, lower jaw, left side, a more advanced lesion was seen, possessing, however, the same characteristic nodular superficial ulceration with reddish and yellowish spots.

Fig. 2. Although typical in appearance, repeated and thorough examination of curettings of these lesions by Dr. Todd failed to demonstrate the presence of tubercle bacilli.

The margins of the ulcerations are rarely indurated. Upon the tongue, however, a slight induration may be felt and especially where healing has occurred, leaving the organ markedly fissured. The character of these indurations is a fibrosis, which has occurred in the healing process.

Case II, Figures 3 and 4, shows a typical case of tuberculosis of the tongue. Figure 3 illustrates the fissured appearance which has resulted in the healing process, the induration on the margin of these fissures being marked. Figure 4 shows an active lesion at the tip of the tongue, presenting all the usual characteristics of tuberculous ulceration. This case was that of a man aged 35, who had had tuberculosis for seven years. He came to Colorado immediately upon development of the trouble. Eleven years ago, or four years before pulmonary tuberculosis was detected, he had a small superficial ulcer upon the dorsum of the tongue, which refused to heal. Subsequently, similar ulcerations on the dorsum developed and continued active for an indefinite period. The patient cannot state exactly when healing began. One year ago the ulceration upon the tip developed, which was extremely painful, a symptom which did not obtain in the ulceration upon the dorsum. When seen at the National Jewish Hospital for Consumptives in December, 1906, the healing process upon the dorsum of the tongue was complete with the exception of two small lesions. The tip of the tongue, however, was in a condition of active ulceration. Careful curettings from the dorsal as well as tip ulcers, showed tubercle bacilli in intimate relation with the epithelial cells. At the present time, May 23, 1907, the patient's general condition is slowly failing, the ulceration upon the tongue, both dorsal and tip, are perfectly cicatrized.

When the disease extends to the soft palate, the anterior or posterior pillars, the uvula or the tonsils, a somewhat different picture presents itself. The very earliest appearance is a marked pallor which is heightened by an edematous swelling. This edema may be extremely slight but it gives to the structure a characteristic appearance. Very careful observation will reveal the presence of numerous yellow or grayish pin head spots just under the surface of these pale, edematous structures.

This condition is typically illustrated by the following cases: Case III, Fig. 5. C. Mc., male, aged 28, referred to me October 2, 1906, by Dr. S. Solis-Cohen of Philadelphia. The patient had slight pulmonary involvement and a tuberculous ulcer of the left arytenoid and vocal band. These lesions had improved under Dr. Cohen's treatment, the improvement continuing after coming to Colorado. On the 27th of February, 1907, both tonsils were swollen, pale and dotted with a few small, grayish deposits. The posterior pillars were slightly edematous. The patient's general condition was failing. A small piece of tonsillar tissue was removed and sections made by Dr. Todd, who reported numerous miliary tubercles with giant cells and caseous centers. A few tubercle bacilli were demonstrated at the edges of the caseous areas.

Case IV, Figure 6. Male, aged 24, referred by Dr. Levitt of New York. This patient was presented before the section of Laryngology at the New York Academy of Medicine by Dr. Emil Mayer, February 27, 1907, demonstrating a possible primary lupus of the larynx. Upon examining the patient March 9th, there were found slight pulmonary involvement, swollen epiglottis, which was red and covered with pin head grayish tubercles and notched in the center, probably from a section removed. The aryepiglottic folds were swollen, pale, edematous and covered with grayish deposits. The arytenoids were moderately swollen and pale. The patient's condition rapidly grew worse, and upon April 9th there was discovered on the right tonsil a whitish deposit. The left tonsil presented a small, irregular, nodular ulceration with whitish imbedded masses. Scrapings from both tonsils were submitted to Dr. Todd, who reported as follows: The cover glass smears from the left tonsil show numerous cells, the structure of which cannot be clearly seen. Careful search shows very few tubercle bacilli scattered among them. The cover glass preparation from the right tonsil contains many squamous epithelial cells and a few other cells which cannot be made out distinctly, and some degenerated material. No tubercle bacilli can be found. Figure 6 shows distinct difference between the two tonsils, the right presenting an exudate upon its surface while the left shows the typical tubercular appearance. The difference in the two tonsils as demonstrated clinically is borne out by the laboratory report.

Following the deposit of tubercles, ulceration rapidly de-

velops, the yellowish spots breaking down and coalescing in an irregular manner, giving to the surface of the ulceration the characteristic worm-eaten or mouse-nibbled appearance. When the ulcerations become deep, as they sometimes do, they still retain upon their margins the characteristic tubercular appearance. This is demonstrated by the following case:

Case V, Figure 7. Male, aged 44, advanced tuberculosis of the lungs and larynx of two years' standing. Three weeks ago the gums became sore and an ulcer developed upon the upper jaw. This seemed to be the result of loose and decayed teeth, which were plainly apparent. The ulceration is a typical deep tubercular ulceration extending to the alveolar process, which is itself necrosed, showing an exposed tooth root. A section of the margin of the ulcer was removed and the laboratory report gives the following: Granulation tissue and a few well defined tubercles with caseous centers; small number of tubercle bacilli scattered about the periphery of the tubercles.

Extensive ulcerations involving the soft palate and posterior structures are illustrated by:

Case VI, Figure 8. Male, aged 40, advanced tuberculosis of the lungs, sore throat at times during the past seven years. For three weeks past there has been painful and difficult swallowing. Examination of the pharynx shows extensive mouse-eaten appearance involving soft palate, both pillars of the fauces, tonsils, uvula and posterior wall of the pharynx downwards to the left side of the larynx. The ulcerations extend forward as far as the junction of the soft with the hard palate.

Diagnosis—The lack of scientific accuracy so frequently displayed in the diagnosis of tuberculosis of the mouth and pharynx is worthy of note. Any or every ulceration of the mucous membrane of the mouth or pharynx in a tuberculous individual is not necessarily tuberculosis. It is feared that this has too often been believed and that it may be the reason so many cases of cure have been reported.

Illustrating this I present:

Case VII, Figure 9. H. T., aged 32, tuberculosis of the lungs, one year. Ulceration on the under surface of the tip of the tongue for six months. These ulcerations are two in number and are not painful. They present a marked red, inflammatory areola, are irregular in outline and show nowhere any of the characteristic grayish or yellow spots, or reddish granulations. They are evidently due to contact with the

sharp lower incisors, aggravated probably by more or less persistent coughing. When last seen, May 19th, the lower ulceration had entirely healed without treatment.

The diagnosis is certain when there is seen a *pale ulceration, without inflammatory areola, superficial, worm-eaten* in appearance, dotted with reddish pin head elevations and having *small yellow or grayish spots* scattered throughout. An early diagnosis when the soft palate or tonsils are involved may be assumed when there appears an extremely *pale, slightly edematous mucous membrane* with *small submucous, pin head yellow spots*.

These diagnostic features, however, are not always present, although they do exist in the vast majority of instances. In all cases the diagnosis should be confirmed by the microscopic findings, and in obscure cases this and the inoculation of guinea pigs are the only positive tests. The finding of giant cells and caseous material together in sections is almost certain proof of tuberculosis.

In case of the ulcers, the laboratory confirms the diagnosis, according to Dr. J. C. Todd of the Pathological Laboratory of the Denver and Gross College of Medicine, in two ways:

1. Detection of tubercle bacilli, (a) by the microscope, or (b) by inoculation of guinea pigs.
2. Detection of the histologic structures of tubercle in stained sections.

(1) Detection of the bacilli:

(a) Owing to possible presence of tubercle bacilli in the mouth, simple examination of swabs from the surface of the ulcer is of little value. The surface of the ulcer should be thoroughly cleansed and then curetted under cocain; or a piece of sufficient size for sections should be excised. Curettings are to be thoroughly rubbed between slides or cover glasses until the cells are sufficiently dissociated to allow thin smears. The presence of tubercle bacilli in the smears may be taken as proof of tuberculosis, provided the surface of the ulcer was well cleansed, and this is made absolutely sure by finding the bacilli within the small clumps of cells which the rubbing between slides failed to separate.

When a piece of sufficient size can be excised, it should be sectioned and stained for tubercle bacilli. Tubercle bacilli are sometimes abundant even when the structure of the tubercle is very doubtful.

(b) Inoculation of guinea pigs is resorted to only when other means fail.

(2) The histologic structure of the miliary tubercle can generally be found in portions of tissue which have been sectioned and stained. Recognition of the tubercle depends upon the presence and, especially, the arrangement of certain structures; no one structure is diagnostic in itself, although its presence may be very suggestive. However, the presence of giant cells and caseation *together* may generally be accepted as proof when the structure is not otherwise typical.

Grunwald¹² has shown how difficult it is to find tubercle bacilli in all tuberculous ulcerations. Hajek¹³ has also called attention to this fact in tuberculosis of the nose, therefore, one can not place all of his reliance upon the presence of these organisms. With few exceptions will one fail to find them present if sufficiently long and accurate search be made. They are usually few in number and scattered and are rarely absent in typical lesions. In the case presented under Figures 1 and 2, the local lesions were absolutely typical in appearance, but in spite of most thorough and repeated search, tubercle bacilli were not found.

Prognosis.—When the affection involves the structures anterior to the soft palate, including the tongue, gums, lips, cheek, hard palate, the prognosis so far as the general lesion is concerned is of comparatively little importance.

Case VIII, Figures 10 and 11. V. G. L., aged 58, has been ill with tuberculosis of the lungs for over fifteen years. Slight ulceration of the hard palate and gums were noticed in October, 1906. These lesions have been comparatively free from pain. There is, however, marked soreness and discomfort, especially upon eating. Figure 10 shows a typical and characteristic tuberculous ulceration of the hard palate, with beveled edges and nodular base. Figure 11 shows more advanced tuberculosis of the gums, rather deeper than usual, with undermined edges, especially inferiorly. Careful curettings from both of these ulcers were examined by Dr. Todd, who easily demonstrated tubercle bacilli, the entire absence of all other bacteria showed the thoroughness with which the parts were cleansed and proved conclusively that the tubercle bacilli were obtained from the ulcerations themselves and were not the result of contamination.

Tuberculous ulcerations rarely heal, but at the same time

their progress is extremely slow. They are the source of but little discomfort and have no special bearing upon the course of an associated general or pulmonary tuberculosis except in so far as they indicate involvement of a small amount of additional tissue. Some of these cases have been said to heal spontaneously, others to have been cured by excision or cauterization. Unquestionably a few rare instances of such cures may be accepted as authentic, such cases representing that comparatively benign form described as "ectogenous" or "ascending." Bernheim¹⁴ states that in bucco-pharyngeal tuberculosis a cure is the rule. Gleason¹⁵ also states the "Prognosis as regards healing is favorable." So firmly convinced am I that these statements are erroneous, that I venture to question the diagnosis.

When tuberculous lesions involve the soft palate, uvula, the tonsils, anterior pillars and the structures posteriorly, the prognosis is of very much more significance. Not only is the prognosis of the local lesions absolutely unfavorable, but their effect upon the general condition of the patient is so deleterious that one can predict a rapid decline and an early and fatal termination. Lesions here are positive evidence of rapidly disseminating miliary tuberculosis.

Two exceptions to the above statements should be made. First, when the lesion involves the tongue the prognosis may be quite as unfavorable as when it involves the pharyngeal structures, and, second, comparatively benign lesion may exist in the posterior wall of the pharynx.

Treatment.—This consists in palliative and curative, and should be both local and general. Palliative treatment is directed to the relief of pain. Cocain or powdered orthoform applied locally are the most valuable remedies. Pain may also be mitigated by curetting and cauterizing, on the theory that the pain is due not so much to the exposed nerves as to the development of small neuromata upon the exposed nerve ends.

Curative.—Ulcers which involve a small portion of the tip or margin of the tongue, or localized tumors have been removed by more or less extensive radical excisions. Temporary healing may be brought about by thorough cauterization, followed by frictional rubbings with lactic acid or formalin. Galvano-cautery has been of some avail and particularly have I seen early tubercular ulcers of the tonsils, lips and tongue heal

under this treatment. Usually these healed ulcers reappear or there develop others adjacent to them. In spite of the generally accepted ultimate fatal outcome of these cases, one should not neglect an attempt at cure, and therefore, in addition to local treatment, the usual attention should be paid to the patient's general welfare. Rest is of prime consideration, owing to the frequent presence of high temperature. The patient's nutrition should be maintained at the highest possible standard by the administration of large quantities of easily digested, nutritious food. When much pain exists this becomes a question of serious moment, and local anesthetics should be abundantly applied. Feeding by means of esophageal tubes cannot be recommended, for the passage of such a tube is of as much discomfort to the patient as the act of swallowing.

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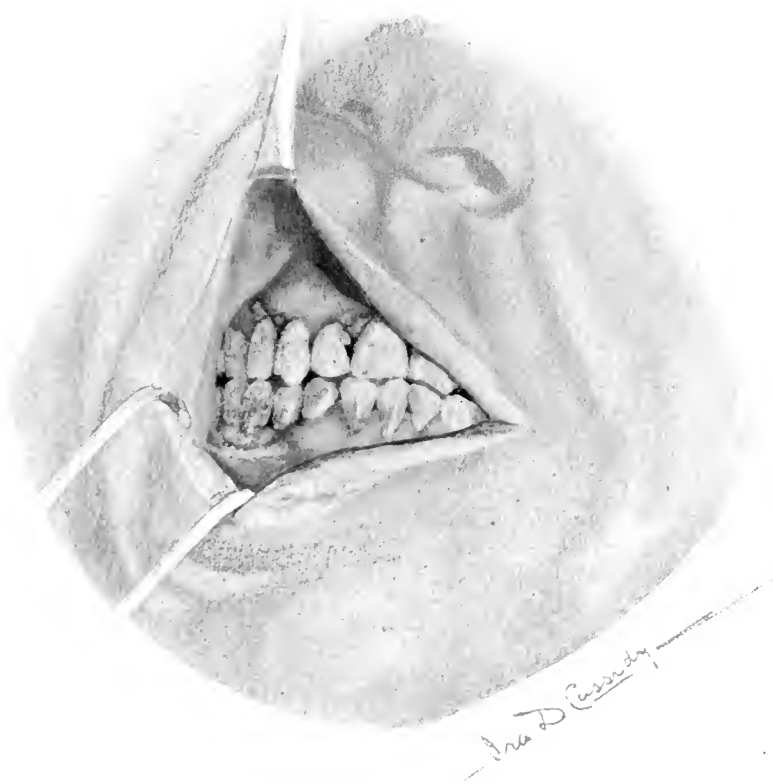


FIG. 1.—Early stage of Tuberculosis of the Gums.

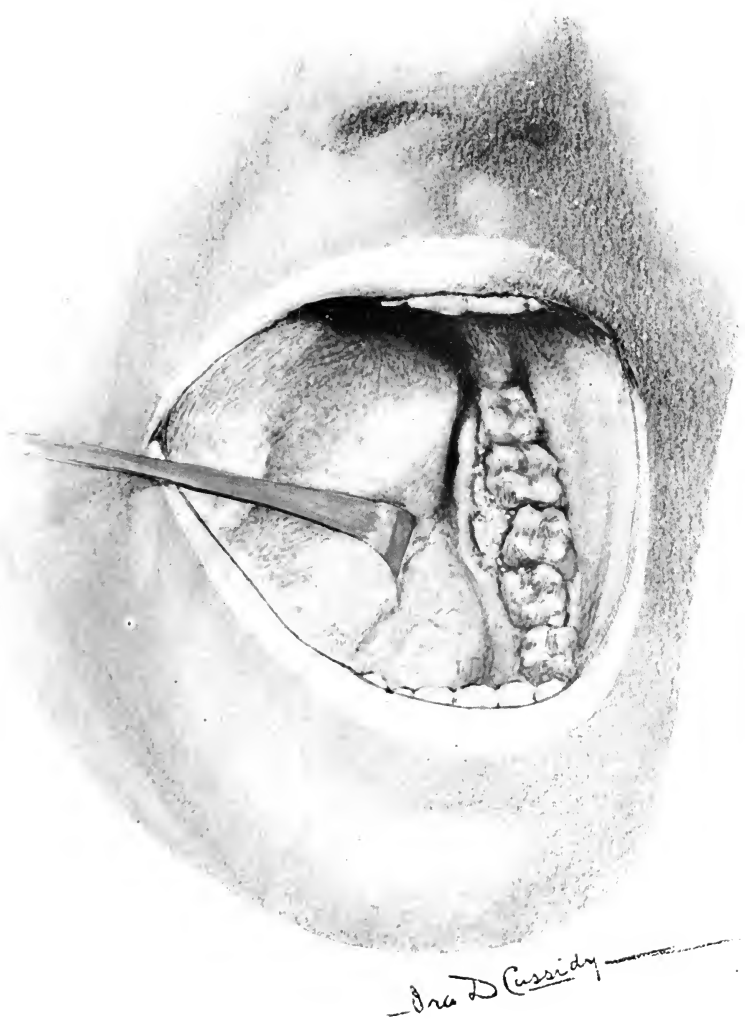


FIG. 2.—Moderately advanced Tuberculosis of the Gums.

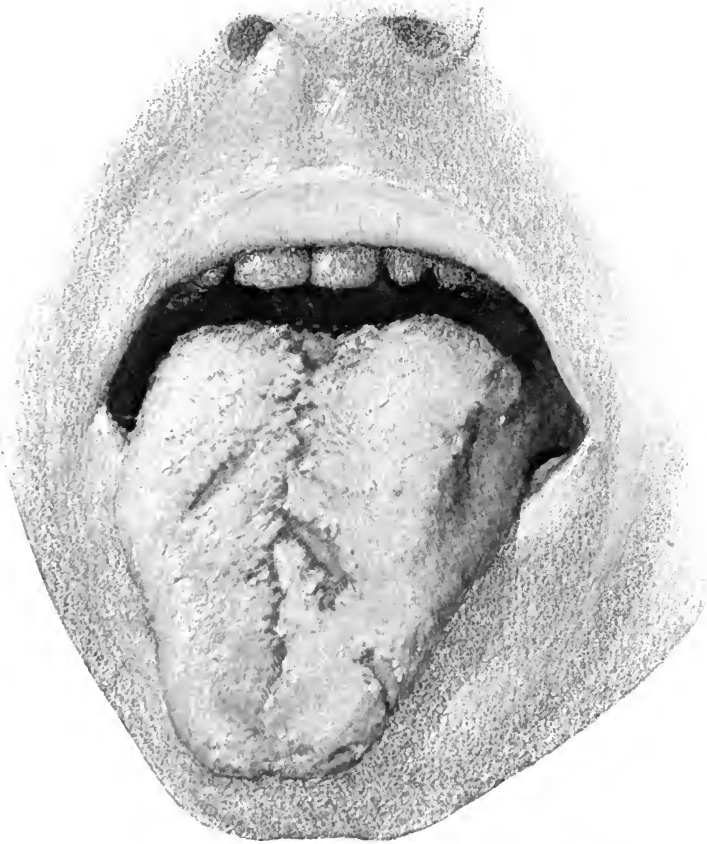
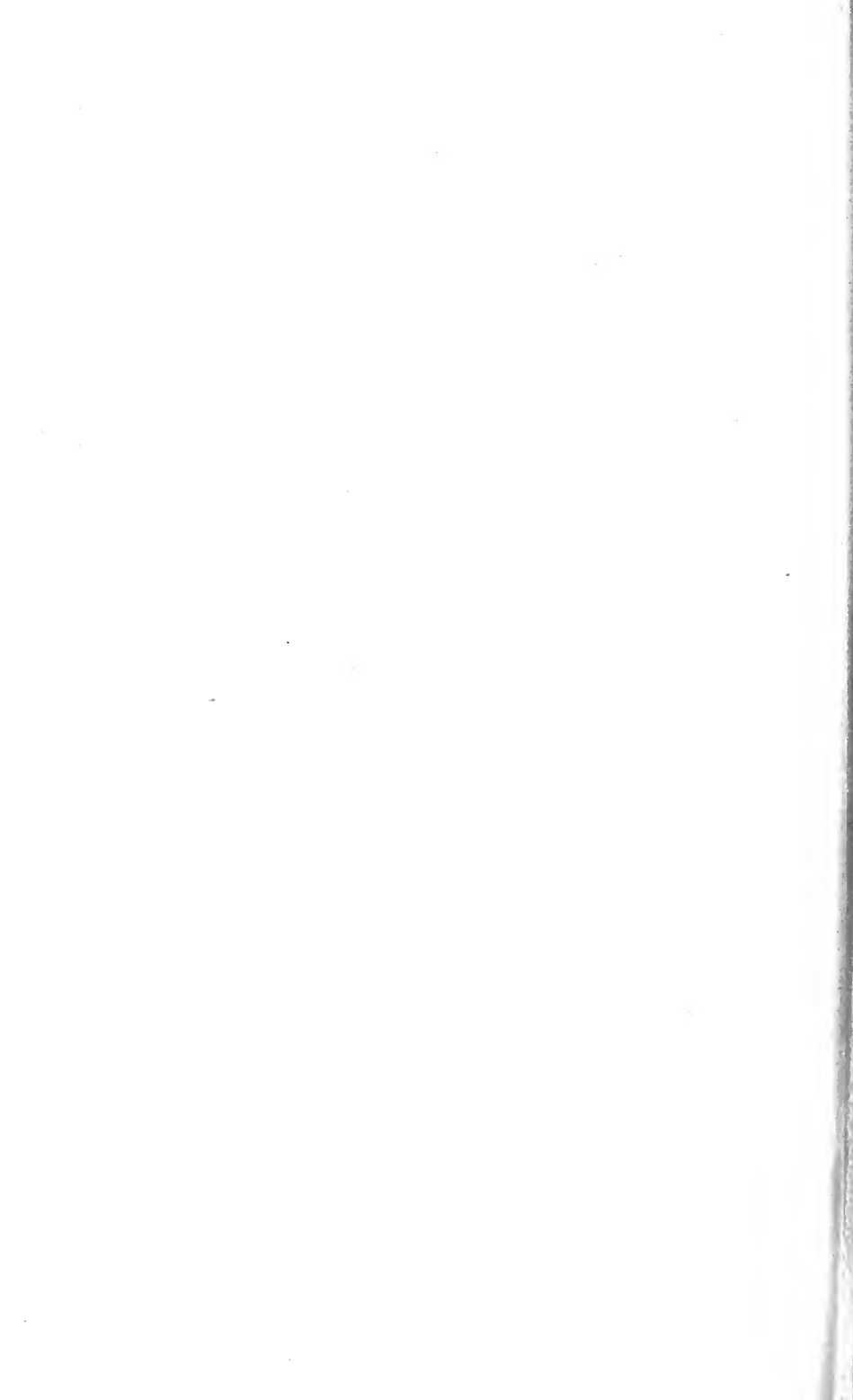


FIG. 3. Tuberculosis of the Tongue Fissured appearance, result of healing process.





FIG. 4.—Active Tubercular Ulcer of the tip of the tongue.



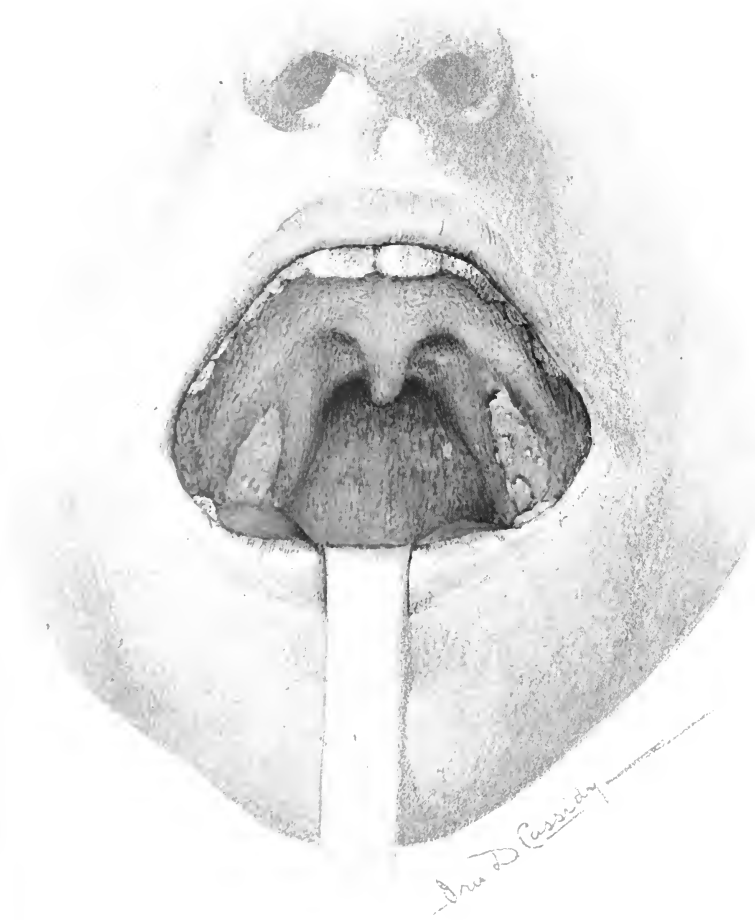


FIG. 5.—Early stage of Tuberculosis of the Tonsils.



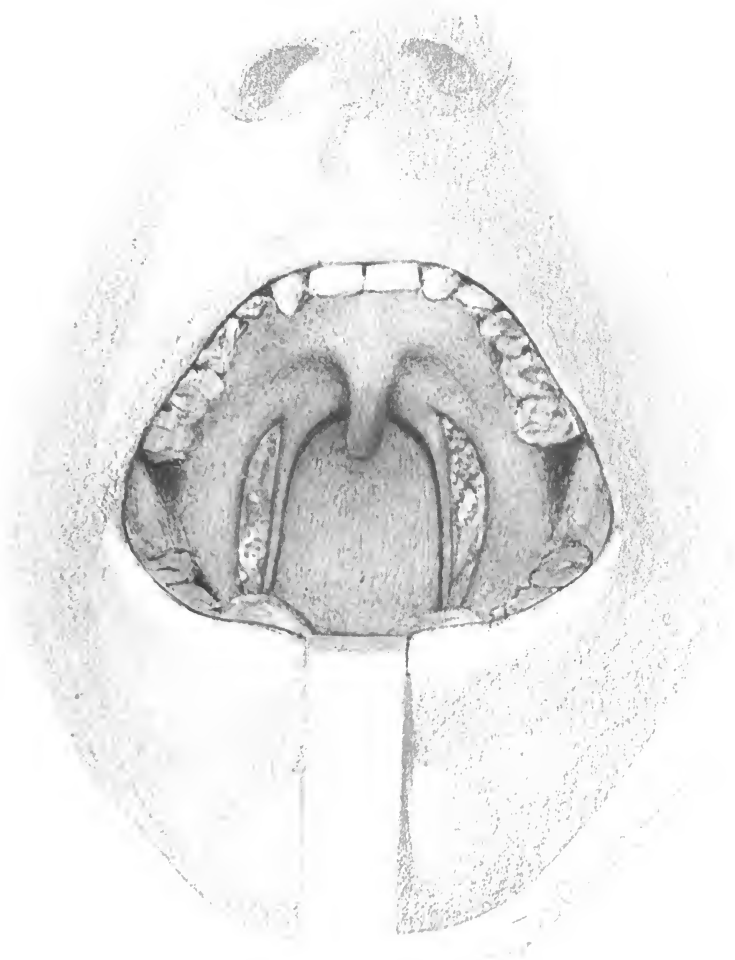
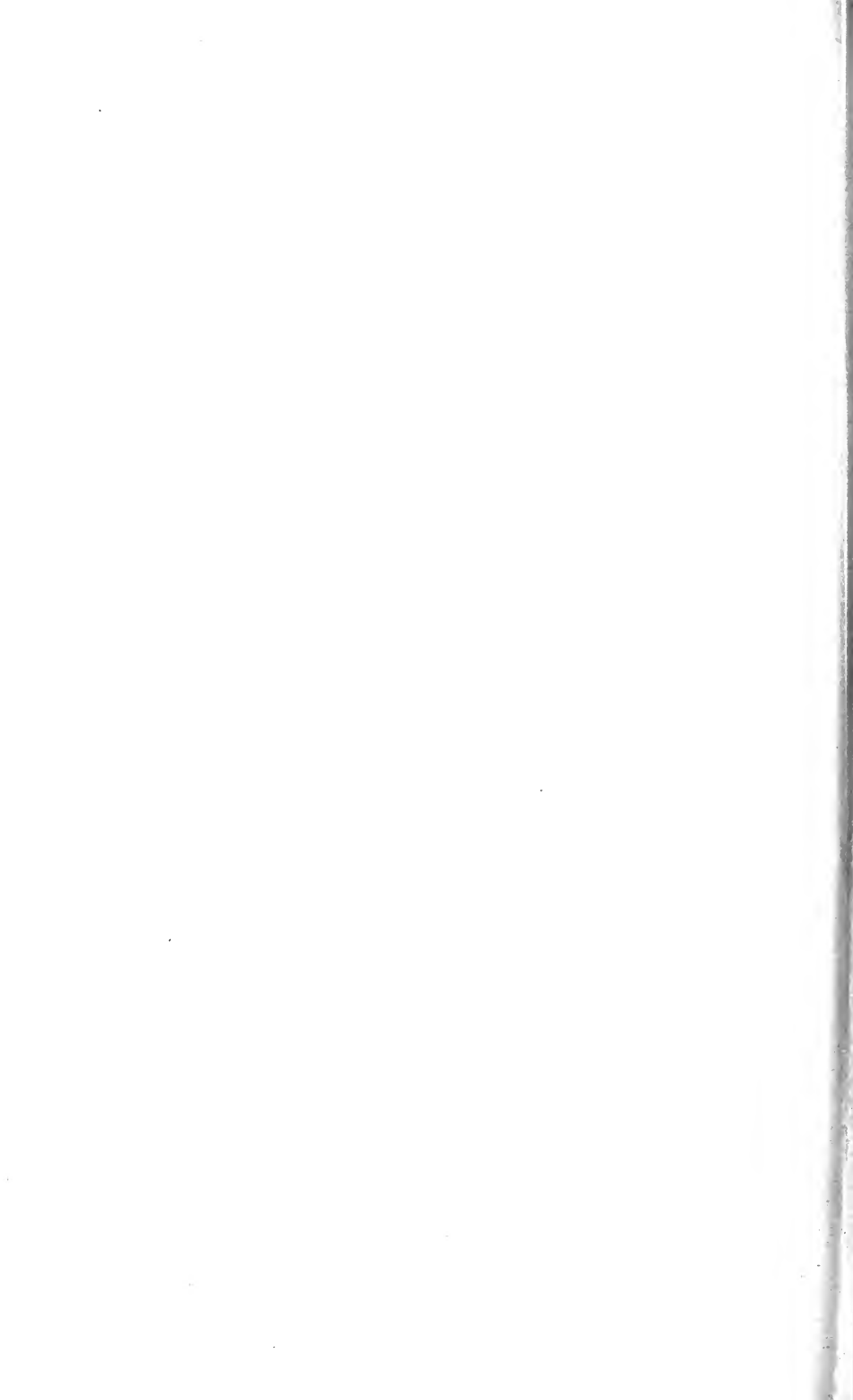


FIG 6,—Demonstrating difference between typical Tuberculosis (left tonsil) and nontubercular exudate (right tonsil.)



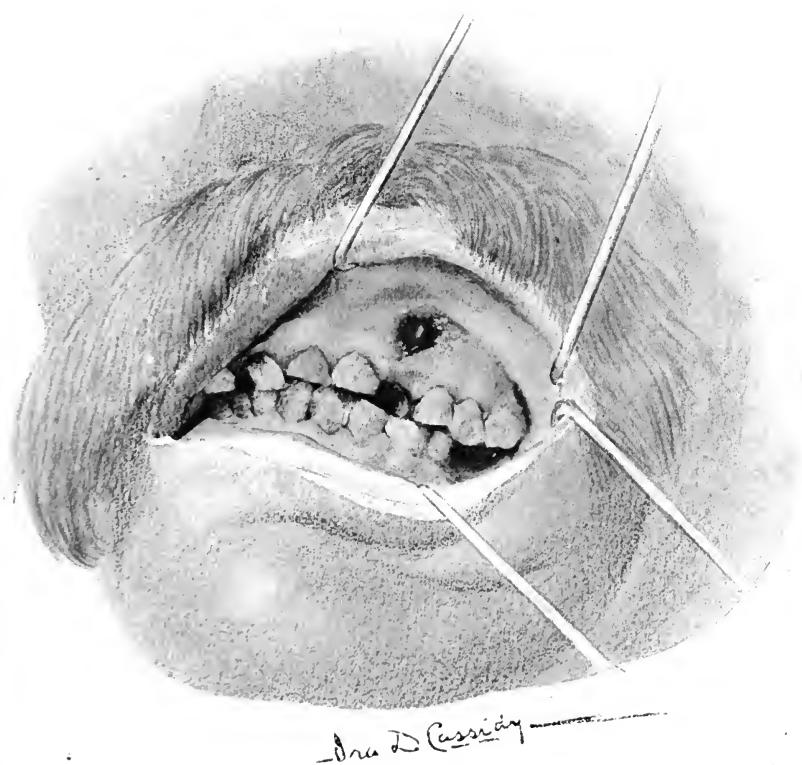


FIG. 7.—Deep Tubercular Ulceration of Gum and Alveolar process, advanced stage.





FIG. 8.—Extensive and advanced Tubercular Ulceration of the soft palate.





H.S. Lowry

FIG. 9.—Non-tubercular Ulcerations of Fraenum in Tuberculous patient.



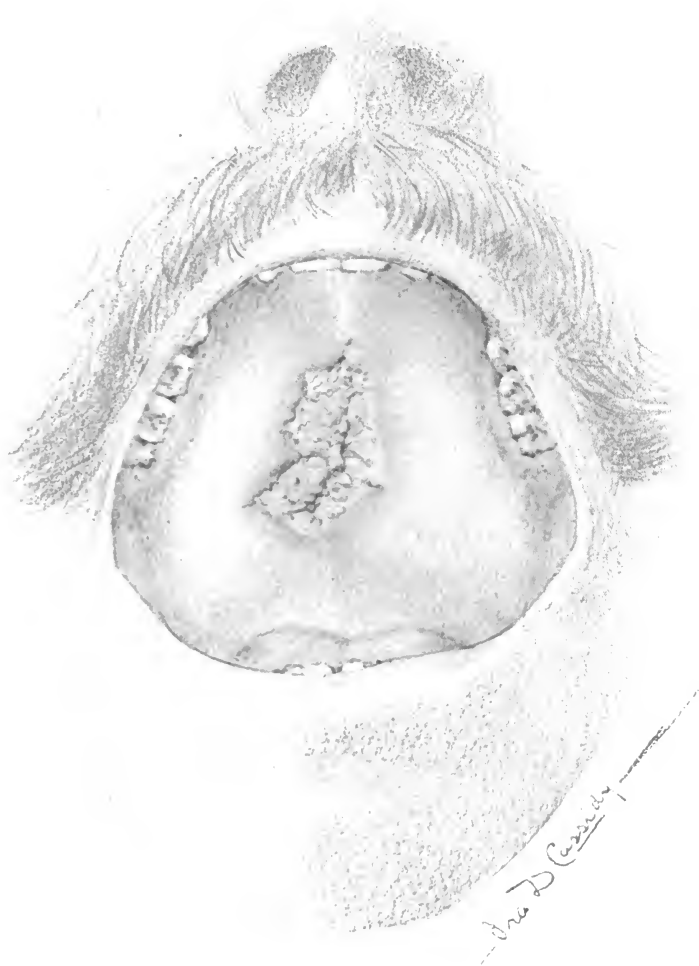


FIG. 10.—Typical Tubercular Ulceration of the hard palate.





FIG. 11.—Advanced Tuberculosis of the gums.



XLIX.

NEW METHODS OF EXAMINATION OF THE SEMI-CIRCULAR CANALS AND THEIR PRACTICAL SIGNIFICANCE.

BY DR. ROBERT BARANY,

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This article treats of the practical value which the investigations in regard to the nature of nystagmus have for the otologist, the ophthalmologist and the neurologist. The subject is a hard one to understand, partly because of the difficulty of comprehending the physiologic and pathologic functions of the vestibular apparatus, and partly because this subject has not yet been treated in the textbooks devoted to otology, ophthalmology and neurology.

First, some anatomic data. The vestibular apparatus consists of three semicircular canals with their ampullae, the utricle and the saccule.

Nothing definite has yet been ascertained concerning the physiologic functions or the symptoms produced in diseases of the utricle and the saccule. The semicircular canals have long been considered the organs for the maintenance of the equilibrium of the body, but nothing positively definite has yet been ascertained to substantiate this theory. All statements in regard to this are based on hypothesis only.

The statements now to be made are facts based on observations made upon hundreds of healthy and diseased persons.

If a person sitting with head upright, on a revolving chair, is turned to the right, there will be noticed a horizontal nystagmus to the right. As soon as the turning is stopped there will be noticed a horizontal rhythmical nystagmus to the left side. This nystagmus is produced by irritation of the horizontal semicircular canals.

The experiment which directly proves this relation between irritation of the horizontal canal and horizontal nystagmus was performed by Professor Ewald in 1892 in Strassburg. He

dissected out the right bony horizontal canal of the pigeon. In the anterior part of the canal he made a little hole and over this fixed a capillary glass tube, within which was a very small glass rod. To the glass tube he attached a rubber tube with bulb. When he compressed the bulb the small glass rod compressed the fluid in the membranous horizontal canal, producing a certain movement of the endolymph. At the same moment there appeared a horizontal nystagmus in the eyes of the pigeon. (An analogous experiment can be made in men in cases where there is a fistula in the bony wall of the labyrinth.) By compression and rarefaction of the air in the external meatus, nystagmus can be produced. By the aid of this procedure, much assistance can be obtained in cases of suspected fistula of the labyrinth.

The rotation of the body on its vertical axis produces movements of the endolymph in the membranous semicircular canals.

The form and direction of the nystagmus produced by rotation depends upon the position of the head during rotation. The distant laws which govern this are more fully described in my monograph on nystagmus.*

If the semicircular canals on both sides are destroyed by disease of the labyrinth, rotation produces no nystagmus. If only one labyrinth is destroyed, nystagmus will be produced by rotation but directed more strongly to the sound than to the diseased side.

In order to make a positive diagnosis of unilateral destruction of the semicircular canals, another method is required, and this I have found. This is known as the method of diagnosis by syringing with hot and cold water. It has long been known that syringing the ear with cold water produces vertigo and nystagmus.

I have made examination of several hundred people and found that in every man with a normal vestibular apparatus, syringing the ear with cold water produces a distinct form of nystagmus, which lasts from half a minute to three minutes. If the right ear, the head being in the upright position, is syringed with cold water, there is produced a rotary and horizontal nystagmus directed toward the left side and is best

*An English translation of the new edition of Dr. Barany's monograph "Untersuchungen über den vom Vestibularapparat des Ohres reflektorisch ausgelösten rhythmischen Nystagmus und seine Begleiterscheinungen" is in preparation and will be published early in 1908. The reader interested in the subject will find the complete monograph well worth study.

observed when the patient looks to the left side. If the water is of the temperature of the body, no nystagmus is produced. This reaction depends entirely on the relation between the temperature of the water and the temperature of the body. The pressure used in syringing has no influence in this connection. If the drum is intact the water must be colder than if there is a perforation, in which latter case the water comes into direct contact with the labyrinth wall, as in middle ear suppuration with large perforation or nearly total absence of the drum. In such cases you often get reaction with water of 35° C. If water of a temperature higher than that of the body is used in syringing, a nystagmus is produced which is directed toward the syringed ear, i. e., just the reverse of that produced by cold water. This reversal of the nystagmus is explained as follows: Imagine a closed cup filled with water of 37° C. to represent the labyrinth. Syringe one side of this cup with cold water. By this means the water which is near to this wall will be cooled and thereby get a greater specific weight than the other and tends to move in direction toward the bottom of the cup, while on the opposite side the warm water rises. In the same way and for the same reason there is produced a movement of the endolymph in the semicircular canal, and this is the cause of the nystagmus. It is self-evident that syringing with hot water will produce exactly the opposite effect and hence will reverse the nystagmus.

It is also self-evident that if the cup be turned 180° the movement of the endolymph is reversed. For the same reason the nystagmus is reversed when the head is directed to the floor.

If the semicircular canals are destroyed, syringing with cold water has no effect. In every middle ear suppuration, it is of great importance to know whether the labyrinth is involved in the suppurative process or not. This syringing with cold or hot water gives a precise answer in many cases where before the diagnosis would have been impossible.

The diseases of the semicircular canals can be divided into three groups.

I. Circumscribed labyrinthitis. Here the canals are not destroyed but their nerve endings are irritated by hyperemia or toxic edema. This irritation causes spontaneous nystagmus. Syringed with cold water these cases all show a typical reaction. Many diseases produce this form of nystagmus. The most important are circumscribed labyrinth suppuration, labyrinth fistula.

II. To the second group belong all the cases where the labyrinth is suddenly paralyzed. This is especially the case in acute diffuse labyrinth suppuration. In this second group syringing the diseased ear produces no nystagmus, but the sudden paralysis of one labyrinth acts in the same way as an irritation of the sound labyrinth and in such cases strong spontaneous nystagmus is manifest (directed to the sound side.)

III. The third group consists of those cases in which the destruction of the inner ear has been produced very slowly and in such a way that neither vertigo nor nystagmus has occurred, and also of cases where the destruction of the labyrinth has been of long duration. In these cases there is no spontaneous nystagmus. Syringing with cold water also gives no reaction.

In the first group spontaneous nystagmus is caused by irritation of the nerve endings of the diseased labyrinth. In these cases the nystagmus is directed to the diseased side.

In the second group, as the sudden paralysis of the diseased labyrinth acts like an irritation of the sound labyrinth the nystagmus is directed to the sound side.

Summing up in tabular form:

GROUP I.

Spontaneous nystagmus to diseased side. Fistula symptoms by compression and rarefaction of air in the external meatus.	Reaction with cold water positive.	Circumscribed labyrinth suppuration; labyrinth fistula.
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GROUP II.

Spontaneous nystagmus to the sound side.	Reaction with cold water negative.	Diffuse acute labyrinth suppuration.
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GROUP III.

No spontaneous nystagmus.	Reaction with cold water negative.	Old diffuse labyrinth suppuration.
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In the first group the nystagmus is not continuous but occurs only from time to time and is specially produced by distinct movements of the head. Bending the head to the diseased side, backward or downward or rotating the head rapidly in the direction of the diseased side produces nystagmus and vertigo. In the interval there is little or no nystagmus.

In the second group the nystagmus directed to the sound side is continuous for two days. It is also present in the horizontal position and becomes stronger on movement. It diminishes spontaneously day by day, becomes intermittent, and after a week or fortnight almost or quite disappears. It then belongs to the third group.

Examination of the older annual reports of any ear clinic will show that a number of patients died of meningitis after the simple radical mastoid operation, patients who before the operation were strong and healthy except perhaps for occasional attacks of vertigo. The post-mortem of such patients always showed the presence of a previously undiagnosed labyrinth suppuration, which, after the radical operation, produced the fatal meningitis.

Labyrinth suppuration is surely the most frequent cause of post-operative meningitis. Deafness alone is not sufficient ground for the diagnosis of labyrinth suppuration. In many cases of deafness the semicircular canals react normally to cold water and neither vertigo nor spontaneous nystagmus has occurred. The diagnosis of labyrinth suppuration is in many cases, especially in the third group, when no spontaneous nystagmus is present, impossible without investigating the reaction with cold water.

The diagnosis of labyrinth suppuration being made, every case of such suppuration should be operated on radically and the labyrinth itself opened at the same time.

Since we have been opening the labyrinth in every case of labyrinth suppuration we have not had any post-operative meningitis. The operation is indeed difficult but we have lost no patients as a result of the operation, although during this year we have operated on more than thirty patients. All the patients have been operated upon after the method of Neuman.

Not only for the diagnosis and treatment of labyrinth suppuration is the consideration of nystagmus very important but

also for the diagnosis of cerebellar abscess and cerebellar tumor, or tumor of the nervus acusticus.

The nystagmus in these cases is produced by irritation or paralysis of the nervus vestibularis or of the nucleus in the medulla oblongata or of Deiters' nucleus.

The diagnosis of cerebellar abscess in middle ear suppuration is very difficult, and I have seen some cases where the nystagmus alone has helped us to the diagnosis with resulting operation and cure of the patient. Most cerebellar abscesses are caused by an old labyrinth suppuration, and in these cases the diagnosis is relatively easy. If one has to deal with a chronic middle ear suppuration without fever, with deafness, and no reaction to cold water, and this patient has strong spontaneous rotatory nystagmus to the diseased side, the diagnosis of cerebellar abscess can be made at once and for the following reasons: If the patient does not react to the syringing with cold water, the labyrinth must be destroyed and he can have spontaneous nystagmus to the sound side or no nystagmus. Spontaneous rotatory nystagmus to the diseased side proves that this nystagmus is produced by an intracranial complication in the posterior fossa of the skull, and as there is no fever and no meningitis there must be a cerebellar abscess. Tumors of the cerebellum or of the acoustic nerve produce analogous symptoms.

In many cases of deafness, normal drum, no reaction to cold water, strong rotatory nystagmus to the diseased side, the diagnosis of acoustic tumor can be made even before the patient gets a paralysis of the facial nerve, of the trigeminus, papillitis optica, etc.

There is another class of patients in which the determination of the nystagmus will be of value. These are cases of trauma of the head, with lesion in the inner ear. Nearly all the cases with cerebral concussion complain of vertigo and disturbances of equilibrium. As a result of the investigation one always finds an organic defect with a traumatic neurosis. The knowledge of nystagmus will help one to distinguish between the two. As regards the nystagmus these cases belong to the second group, have fits of vertigo occasioned by irritation of the nerve endings in the ampullae. These attacks occur without any apparent cause or in connection with the distinct movement of the head previously mentioned, viz.: bending or turning the head to the side, bending the head down-

ward or backward, sudden rising from the horizontal to the vertical position, and quick walking. It is very important to know that these movements do not always produce vertigo or nystagmus; if the patient has had vertigo just before there will be a long pause before vertigo or nystagmus will again be produced. If strong nystagmus is observed there is organic lesion. Many of these patients not only have vertigo but also nausea and vomiting, and it may be, partial loss of consciousness. These concomitant symptoms are of neurotic nature. Also, the disturbances of equilibrium are mostly neurotic. Disturbances of equilibrium in connection with nystagmus must have a distinct character; they are determined by the form and direction of the nystagmus and the position of the head. If there is rotatory nystagmus to the right side, the patient will fall to the left side if the head is upright. If the head is turned to the left he will fall forward. If the head be turned to the right he will fall backward. In cases of traumatic neurosis, disturbances of equilibrium do not follow these rules or are exaggerated. The falling is in no definite direction, to the right, the left or backward like a stick, and turning the head has no influence on the direction in which he falls. The knowledge of the phenomena of nystagmus incident to these cases will enable one to determine how much of the phenomena of which the patient complains is of organic or neurotic origin.

L.

CIRCUMSCRIBED PURULENT INFLAMMATION OF THE LABYRINTH.*

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Previous discussions regarding purulent inflammation of the labyrinth have had to do principally with the diffuse inflammations, while the circumscribed labyrinthine inflammations have been but briefly touched upon. According to our experience based upon a large amount of clinical material, it is the circumscribed inflammations of the labyrinth which should be considered of the first importance. My statistics to which I shall later refer in detail assuredly prove that circumscribed inflammations of the labyrinth are not only of the greatest prognostic significance but also of the greatest weight as a point of indication for the operative opening of the labyrinth.

From the clinical standpoint, we divide the purulent inflammations of the labyrinth arising from acute and chronic purulent middle ear diseases into the following classes:

1. Diffuse and circumscribed.
2. Manifest and latent.

An exact test of the condition of the labyrinth is of fundamental importance before doing any middle ear operation. The hearing tests are made with the tuning fork, speaking tube, the tests of Lucae-Dennert and Stenger, and the continuous tone series of Bezold, while the excitability and condition of the vestibular apparatus are tested with hot and cold syringing, rotation of the body and compression and expansion of the air in the external canal, etc. The condition

*Paper read before the German Otological Society in Bremen, May 17, 1907.

of the labyrinth thus revealed gives, as a rule, a true and reliable picture of the pathologic conditions in the interior of the labyrinth and renders possible an exact localization of the same in its individual portions.

Especially is the fundamental testing of the vestibular apparatus of importance for further action and for the place of operation upon the labyrinth.

Manifest, circumscribed disease of the vestibular apparatus shows itself by sharply marked clinical symptoms (vertigo, disturbance in maintenance of body equilibrium, nystagmus and the like), while the latent purulent inflammations in the region of the vestibular apparatus run their course without symptoms and can be diagnosed only with the aid of an exact testing of the labyrinthine functions.

It is therefore clear that following the complete radical mastoid operation, such a circumscribed latent purulent inflammation may become manifest and produce a fatal post-operative meningitis.

If, however, the functions of the labyrinth are carefully tested before the radical operation and the possibility of circumscribed purulent inflammation considered in our calculations, we can with certainty prevent such fatal accidents. As a matter of fact, in our clinic, in all those cases where the above mentioned points were sufficiently determinative we have had no deaths to deplore.

It is to be stated emphatically that for the recognition of circumscribed purulent areas, it is the test of the function of the vestibular apparatus to which we must specially direct our attention.

For the most part the hearing test leaves us in the lurch. In by far the greater number of cases, we are unable to say whether the difficult hearing or absolute deafness which we discover is the result of purulent inflammation in the labyrinth or in the middle ear. Only in those cases where a high degree of deafness or absolute deafness appears suddenly can we with certainty locate it in the labyrinth.

Under the term manifest diffuse purulent inflammation of the labyrinth, whether occurring in course of acute or chronic middle ear suppuration, I include all those cases where besides the sudden appearance of a high degree of deafness or absolute deafness, clearly defined vestibular symptoms are present. These symptoms manifest themselves in spontaneous nystagmus toward the sound side (through a failure of function of the

vestibular apparatus of the diseased side or through an overbalancing of the sound side), and in very much lessened sensibility, even to absolute loss, of the vestibular apparatus of the diseased side, together with dizziness, vomiting and disturbance of equilibrium.

In diffuse latent purulent inflammation of the labyrinth, there is neither disturbance of equilibrium, vertigo nor nystagmus, and the presence of such an inflammation can be supposed only when, besides the sudden appearance of absolute deafness or a high degree of loss of hearing stated by a patient, the testing of the vestibular apparatus shows complete loss of its function or a high degree of diminution of its irritability.

The circumscribed purulent inflammations of the labyrinth in the same way can be divided into manifest and latent. They affect either the cochlea or the vestibule. Occasionally they are limited to a circumscribed portion of the cochlea or the vestibule.

Before proceeding to consider these last, I will briefly describe those transitory labyrinth symptoms that not infrequently follow middle ear operations. They are caused by increase in the labyrinthine pressure, either by retention of pus in the middle ear, or too tight pressure from gauze wicks and the like, or by otitis of the pyramid without disease of the labyrinthine contents. They disappear rapidly and may maintain their physiologic reactions.

The circumscribed purulent inflammations of the labyrinth may be localized either in the cochlea or the vestibular apparatus; occasionally they affect only a narrow, sharply defined area. Of my 52 cases of purulent labyrinthitis, seventeen (32.7 per cent) were circumscribed. The circumscribed forms can be divided into manifest and latent. For the determination of the very necessary information, whether in the individual case we have to do with the manifest or latent circumscribed purulent labyrinthitis, we can depend only upon the result of the test of the functions of the vestibular apparatus. For example, if there is present hearing and spontaneous nystagmus to the diseased side, while the examination of the irritability of the corresponding vestibular apparatus shows it still present, then we have to deal with the manifest limited purulent inflammation of the vestibular apparatus, in case the fistula symptom is present or the radical operation dis-

closes the presence of a fistula. If, on the other hand, fistula and fistula symptoms are absent, there remains merely disease of the labyrinth capsule. At the same time there are present the known symptoms of vestibular disease, such as dizziness, disturbances of equilibrium, ataxia and the like. If, on the other hand, these symptoms completely fail, and the hearing function is maintained, while the functional tests of the affected vestibular apparatus shows a great diminution or absolute failure of excitability, then we have to deal with the circumscribed latent purulent inflammation of the vestibular apparatus.

Much more difficult are the conditions when we have to deal with a circumscribed purulent inflammation of the cochlea. If we meet with total labyrinthine deafness in the presence of maintained vestibular function, the next thing which must be searched for is a basic point which can be used in disturbance of the hearing due to purulent inflammation of the cochlea. It is necessary in this connection to know the clinical history. If the patient relates that the complete deafness appeared suddenly and was accompanied with vestibular symptoms, as vertigo, disturbances of equilibrium, nausea, vomiting and the like, then (in so far as the functional tests show the vestibular apparatus to be in normal condition) we can assume a circumscribed purulent disease of the cochlea to be present. This supposition acquires greater probability in cases where the laying bare of the middle ear cavity reveals the presence of the labyrinth fistula.

As regards the term labyrinth fistula, I would state that in common with Hinsberg, Wittmaack and others, I use the word fistula only when a purulent canal leads from the interior of the labyrinth outwards or conversely from the middle ear to the labyrinth. Superficial erosion from pressure limited to the bony labyrinthine capsule or purulent softening is in the anatomic sense no fistula. It is on the other hand to be called a defect in the labyrinthine wall or a defect in the semicircular canals. As a rule, such defects in the bony wall act as a point of lessened resistance for the membranous labyrinth, because through the breaking down of its bony protecting wall, traumatic and inflammatory injuries are easily received. In the presence of inflammatory processes within the middle ear, such a labyrinth is in a condition of increased excitability, so that even a slight irritation is capable of setting

up serious vestibular symptoms. Sometimes a slight mechanical irritation, as too tight packing of cotton, increased or diminished air pressure, produces sufficient irritation to bring about severe symptoms in the vestibular apparatus.

Although, as appears from the foregoing, there is a good deal of difficulty in the making of the diagnosis of a defect in the labyrinth capsule, it is nevertheless a valuable supporting fact in the interpretation of the clinical appearances. If for example, we have the history of a suddenly appearing absolute deafness and the radical operation shows a defect in the labyrinth wall, the pathologico-anatomic substratum of which cannot be determined on the living with certainty, nevertheless this defect can with the greatest probability be considered as a fistula and the clinically produced absolute deafness as due to a purulent inflammation of the cochlea. The same applies as a matter of course to defects or fistulae of the semicircular canals.

The points of view just developed were determinative for me as furnishing the indications for opening the labyrinth, although we must emphasize the fact that precise indications can be established only from the relationship between the clinical symptoms taken in connection with the findings at operations.

Tabulated indications as given by me include only the main types of purulent disease of the labyrinth as, on account of the many variations in the clinical picture, a complete classification of all the appearances is hardly possible. I can, however, express the conviction, based on a large clinical experience, that this table is of value in every case. I will now briefly consider the individual indications.

1. The hearing and vestibular functions are intact and the total radical operation shows the presence of a fistula. As regards the intactness of the labyrinth function, it must be taken into consideration that in this case there is not a real fistula but a defect in the labyrinthine wall. If spontaneous nystagmus appears, it is due to an irritation of the vestibular apparatus from hyperemia, increased pressure and the like. Since it is a case of a complicated middle ear process, the opening of the labyrinth without regard to the presence of spontaneous nystagmus is contraindicated. I recall eight such cases, in two of which, it is true, the labyrinth operation was done. In one case there appeared severe meningeal

symptoms; in the second a deep extradural abscess gave the indication for the opening of the labyrinth—both cases recovered.

2. Hearing gone, vestibular apparatus functioning (irritable) and the radical operation shows a fistula. If in this case there is any spontaneous nystagmus, we have to deal with a circumscribed purulent disease of the vestibule. If at the same time there is present increasing temperature with meningeal symptoms—the opening of the labyrinth is indicated. On the other hand, this is not to be done if the temperature is normal. The labyrinth operation is contraindicated if spontaneous nystagmus is absent. My statistics cover ten such cases, of which eight had spontaneous nystagmus. The labyrinth operation was done six times with good results. One patient died of tubercular meningitis, the other of acute purulent leptomeningitis. In the last case, for other reasons, only a simple opening of the mastoid was done. The remaining two cases without spontaneous nystagmus healed completely after the radical mastoid without delay.

3. Hearing present, vestibular apparatus does not react, and the radical operation shows a fistula. In such cases there is no doubt that we have to deal with a circumscribed purulent disease of the semicircular canals and the labyrinth operation is indicated in the presence of the other accompanying symptoms, especially increasing fever. As regards the indication for operation, the presence or absence of spontaneous nystagmus does not come into consideration. My statistics cover two such cases, which had spontaneous nystagmus. In one case the labyrinth operation was undertaken. The first case was a circumscribed purulent inflammation of the semicircular canal for which a radical operation was done. In the second case, the increase of temperature gave the indication for the opening of the labyrinth.

4. This group includes those cases where the hearing function is present, the vestibular apparatus does not react, but no labyrinthine fistula is found at the radical operation. If we consider that, aside from this, the symptoms indicate purulent disease of the labyrinth and especially if there is increasing temperature, then we perform the labyrinth operation immediately after the radical operation. This applies also to those cases where the laying bare of the middle ear area uncovers other complications, such as deep seated extradural

abscess, cerebellar abscess and the like. I have observations concerning two cases belonging to this class. In the one case there was a deep extradural abscess whose point of origin, based on previous testing of the labyrinth, must have been in the vestibular apparatus. I accordingly did the radical operation and the labyrinth operation at the same time, and the further history of the cases showed the correctness of the method of procedure. Several days after the opening of the labyrinth, there appeared the symptoms of a cerebellar abscess which was evacuated and the patient recovered. Without the previous operation on the labyrinth the diagnosis of cerebellar abscess would have been impossible, since it was based entirely on the sudden reversal of the nystagmus. Before the labyrinth operation the nystagmus was toward the sound side. In the second case, in which neither increased temperature nor other special labyrinth symptoms, with the exception of spontaneous nystagmus, were present, I refrained from opening the labyrinth.

5. Hearing power and vestibular function both destroyed; fistula in the labyrinth capsule. While this group, strictly speaking, must be classed among the diffuse purulent inflammations of the labyrinth, I will discuss it here briefly as it includes the cases of greatest practical importance. Without regard to the presence or absence of spontaneous nystagmus, the radical labyrinth operation on one side is absolutely indicated.

My own cases in this group are ten in number, in six of which spontaneous nystagmus was present. Of these six, five recovered, one died. As this last case is of especial interest and is suitable for showing most clearly the point of election for the operation, I will briefly describe it. The patient was twenty years old; there was entire loss of hearing and vestibular function, with spontaneous nystagmus towards the sound side. She showed the typical picture of manifest diffuse labyrinthitic suppuration. On laying bare the middle ear region, a fistula of the semicircular canal was found, so that according to my view the immediate radical labyrinth operation was indicated. For other reasons the labyrinth operation was not performed and the patient went on to purulent leptomeningitis. Had the labyrinth been opened at the time of operation, the patient's life would in all probability have been saved. Of the other four cases, which without spontaneous nystagmus were latent diffuse purulent laby-

rinthitis, one died of tubercular meningitis, one of pleuropneumonia, and two got well.

6. Hearing and vestibular function gone, no labyrinth fistula. If spontaneous nystagmus appears it is certain that we have to do with a manifest diffuse purulent labyrinthitis, where the fistula is not visible macroscopically. Here the one-sided opening of the labyrinth is absolutely indicated.

I have had four cases of this class with two deaths. In one case the operation had to be stopped during the laying bare of the middle ear cavity on account of asphyxia during the narcosis.

In the second case there was already present a diffuse purulent meningitis (thick fluid from lumbar puncture); the other two cases recovered. If spontaneous nystagmus is absent, then we have latent diffuse purulent labyrinthitis. Here the labyrinth operation is to be considered only under special circumstances, as fever, meningeal symptoms and the like. My statistics cover six such cases. In two cases there were sequestra of the pyramid with healing; twice I left the labyrinth operation out of consideration. In one case the sudden appearance of facial paralysis gave the indication for the labyrinth operation, and in one case the labyrinth operation was discontinued and the patient had post-operative meningitis.

7. Hearing function gone. Vestibular apparatus normal, no labyrinth fistula. In this class of cases we do not consider opening the labyrinth. In five cases observed by me there was spontaneous nystagmus in two, while it was absent in three. Of the latter, two recovered after the radical operation, one died of a symptomless brain abscess (temporosphenoidal). The two cases with spontaneous nystagmus recovered.

From the foregoing it is evident that where treatment followed the developed diagnostic points and the symptoms were fairly clear and well supported, a good result was brought about. The discovery of an already existent latent purulent process in the labyrinth is of primary importance. If we are able to ascertain this, and make the presence of a purulent focus probable, then there is strong probability of preventing the post-operative meningitis.

Of my 52 cases of infective labyrinth inflammation, in 27 the labyrinth operation was performed. Healing resulted in 20 cases; in seven, death resulted. Of the deaths, two took place from tubercular meningitis, one each of pleuropneumonia

and brain abscess, two of acute purulent leptomeningitis (in these the labyrinth, contrary to my indication, was not opened at the time of the radical operation but later), and in one case there was present at the time of admittance a diffuse purulent leptomeningitis. In no case was the labyrinth operation as such the cause of the fatal result. On the other hand, the study of my cases has given the significant result that as a rule the fatal result was due to the failure to perform the labyrinth operation at the right time. It is of great importance to find before doing the radical operation whether the opening of the labyrinth is to be done immediately following or not. In a number of cases it is impossible to determine beforehand whether the labyrinth should or should not be immediately opened, yet even here the anatomic appearances of the labyrinth wall of the semicircular canals, gives us valuable information for our further action.

Of the remaining twenty-five cases, where there was no positive indication for opening the labyrinth, an operative purulent lesion of the semicircular canals was twice found with resulting recovery.

Fifteen times a fistula was found in the semicircular canals, once on the tentorium. Fifteen cases were operated radically and one treated conservatively; all recovered. Of the ten cases where no fistula was found at the operation, nine were radically operated and one treated conservatively; all recovered.

It has not been my purpose to give all the observations which have served to give us light on this subject, or to construct a table which is to be considered as the final word on this subject, but to lay before you the principal diagnostic points. These are not the result of theoretic considerations, but of observation on a large amount of clinical material.

It admits of no doubt that future investigations will bring to pass important changes in our observations and in the views advanced by me. However, I think I am not mistaken in asserting that the points cited are of practical value and should be carefully weighed. Whenever I have been able to proceed according to the indications enumerated, there have been no bad results.

LI.

THE CONSTRUCTION OF THE ETHMOID LABYRINTH.

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Anatomically, as well as clinically, the ethmoid labyrinth occupies a central position in its relation to the other nasal accessory sinuses. Diseases of the frontal and maxillary sinuses are frequently combined with an involvement of the cells of the ethmoid. That this association is dependent on the close anatomic relations existing between the frontal sinus and the ethmoid labyrinth on the one hand and the maxillary sinus and the ethmoid labyrinth on the other, there can be little doubt.

The object of this paper is to call attention to certain fundamental facts in the construction of the ethmoid labyrinth, and to point out the close anatomic relations existing between the ethmoid labyrinth and the other nasal accessory sinuses.

The location of the ethmoid labyrinth is well shown in a cross section as in Fig. 1. The labyrinth lies external to the meatus nasi communis and internal to the orbit and the antrum. Above is the floor of the anterior cranial fossa and below is the meatus nasi media. The inferior and median walls of the labyrinth are marked by several conspicuous structures. These are, from below upward, the processus uncinatus, the bulla ethmoidalis, the concha media, the concha superior, and the concha suprema.

In a section made through the ethmoid the labyrinth is seen to be made up of a number of air spaces or cells, which vary in size and are separated from each other by thin bony plates. These plates are formed with very little regularity. They have, however, certain relations in common. In the first place, all

the plates end abruptly as soon as either the orbital wall or the upper wall of the labyrinth is reached (see Figs. 1, 2, 3). This is not the case, however, on the median aspect of the ethmoid labyrinth. Here the plates do not end abruptly, but project beyond the labyrinth and form prominences which extend into the nasal chamber (see Fig. 2). The prominences thus formed by the extension of the partition plates of the ethmoid labyrinth over in the nasal fossa are known respectively as the *processus uncinatus*, the *bullae ethmoidalis*, the *concha media*, the *concha superior* and the *concha suprema*.

The openings for the several ethmoid cells into the nasal chambers are always found between these prominences formed by the extension of the partition plates, that is, between the *unciform* and the *bullae*, between the *bullae* and the *concha media* and between the *concha media* and the *concha superior*. This relation of the plates of the ethmoid labyrinth and the several openings of the ethmoid cells into the nasal chambers is well shown in Fig. 2. In this preparation an unusually simple, uncomplicated arrangement of the several ethmoid cells is found. Such preparations may be looked upon as representing the typical construction of the ethmoid labyrinth. The study of such a preparation will assist greatly to an understanding of what is sometimes referred to as the architecture of the ethmoid labyrinth. In the preparation shown in Fig. 2 the somewhat atrophic *concha media* has been partially detached. The *concha superior* is even smaller than usual, while the *concha suprema* is absent. The compartments or cells of the labyrinth have an extremely simple arrangement, owing to the fact that the several partition plates extend through not only to the orbital wall but to the upper wall of the labyrinth as well. In this preparation, moreover, but a single instance is noted where the several cells of the labyrinth communicate on account of imperfect separating plates. Usually a number of such defects in the separating plates exist and necessarily give to the labyrinth a much more complicated arrangement.

The lower or first plate of the ethmoid forms the *processus uncinatus*. This plate is always in a rudimentary state and only occasionally is it found forming the upper boundary of an ethmoid cell. When such a cell exists it forms a large *ager nasi* (see Fig. 4).

The second plate of the ethmoid is called the plate of the

bullae because the extension of this plate into the nasal chamber forms the bulla ethmoidalis. Between the processus uncinatus below and the bulla ethmoidalis above is found a depression or trough. The mouth of this trough is called the hiatus semilunaris, whereas the depression or trough itself is known as the infundibulum ethmoidale. Into this infundibulum there are several openings. In its posterior end is the opening for the maxillary sinus. The anterior end of the infundibulum opens usually into the frontal sinus. Besides the openings for these two accessory sinuses, one or more ethmoid cells frequently open into the infundibulum. These cells are called the infundibular ethmoid cells. Such cells are usually located in the unciform process (see Fig. 4) or they are cells formed by a closure of the anterior end of the infundibulum which dilates in the floor of the frontal sinus into an ethmoid cell, as shown in Fig. 5.

The third partition plate of the ethmoid labyrinth is the plate of the concha media (see Fig. 2). Between the second and third ethmoid plates, that is, between the plate of the bulla and the plate of the concha media, is an opening usually quite large, leading into the ethmoid labyrinth. This is the opening for the anterior, or, as they are sometimes called, the middle ethmoid cells.

The fourth partition plate is the plate of the concha superior. Between the extension of the third and fourth plates, that is, between the concha media and the concha superior, is the meatus nasi superior. Into this meatus there are usually several openings leading from the ethmoid labyrinth. These are the openings for the posterior series of ethmoid cells.

The fifth partition plate is the plate of the concha suprema, and like this structure, it is often entirely wanting. In the preparation shown in Fig. 2, the plate of the concha suprema is developed, although the extension of this plate, the concha suprema, is itself scarcely detectable. The plate in this preparation, however, is imperfectly formed, allowing free communication between the ethmoid cells on either side of it.

This arrangement of partition plates and openings for ethmoid cells represents what is understood as the typical or fundamental architecture of the ethmoid labyrinth. The great complexity in the construction of the ethmoid, which has given rise to the term labyrinth, is the result in the first place of

extreme irregularity in the formation of the partition plates, and in the second place of the occurrence of defects in the several partition plates, allowing of communication between cells belonging to the different groups, that is, between cells of the anterior and posterior ethmoid series. This irregularity in the formation of the partition plates results at times in producing a large number of small cells, and at other times in producing extremely large ethmoid cells, so that occasionally the whole ethmoid labyrinth consists of but a couple of very large ethmoid cells. This same irregularity in the formation of the plates of the ethmoid results sometimes in carrying an ethmoid cell belonging to the anterior series well back to the posterior end of the labyrinth. In this case the opening being found between the bulla and the concha media in the meatus nasi media, shows clearly that the cell must be classed as an anterior or middle ethmoid cell. On the other hand, a posterior ethmoid cell with its opening in the superior meatus, that is, between the concha media and the concha superior, is sometimes pushed so far forward as to produce a prominence in the floor of the frontal sinus.

Still another result of the irregular formation of the ethmoid labyrinth is the tendency for ethmoid cells to develop outside the usual confines of the labyrinth. Such anatomic variations are by no means uncommon, and when met with clinically or post-mortem their true nature has often been misunderstood. For example, an ethmoid cell is sometimes pushed back into the sphenoid sinus where it occupies the upper part of this cavity. This has sometimes been wrongly interpreted as representing a double sphenoid sinus. More frequent is the invasion of the frontal sinus by an ethmoid cell. Here, too, the wrong interpretation has often been given that a double frontal sinus exists. This is especially likely to be the interpretation when the ethmoid cell which has pushed into the frontal sinus is a large one.

An ethmoid cell which has developed at the expense of the frontal sinus is known as a bulla frontalis. It may have its origin in one of three ways: First, by an anomaly in the plate of the unciform process, by which an ethmoid cell, developing in front of the process, pushes this plate up into the frontal sinus, as shown in Fig. 6. Second, by the development of an ethmoid cell in the closed anterior end of the infundibulum, as

shown in Fig. 5. This cell may expand in the floor of the frontal sinus and produce a bulla frontalis. The third way in which the bulla frontalis is known to form is when the plate of the bulla ethmoidalis is pushed forward into the frontal sinus. Examples of ethmoid cells which have invaded the frontal sinus are shown in Figs. 4, 5, 6, 7. These cells are found at times almost completely filling the frontal sinus.

The occurrence of an ethmoid cell in the anterior end of the concha media is quite common. Occasionally such a cell becomes very large, producing a cystic enlargement of the anterior end of the turbinated body (see Fig. 7). This condition is known as a concha bullosa. That these cystic enlargements of the concha media represent but an enlarged ethmoid cell which has expanded in the turbinated body, has often been overlooked, and some rather interesting hypotheses have been advanced to explain their origin. Some have considered this condition to be the result of a "rarefying otitis." By others these cysts are supposed to be caused by a curling under of the free edge of concha media which in turn becomes attached along the base of the turbinated body in the middle meatus. The occasional large size of the cyst is then explained as the result of a dilatation of this cavity from its filling with mucus. Others have looked upon these cysts as ethmoid cells that have expanded and been pushed out into the turbinated body on account of the existence of a closed empyema of the ethmoid labyrinth.

The real nature of these cysts of the concha media is undoubtedly the same as of the ethmoid cells which invade the frontal or the sphenoid sinuses. They represent an anatomic variation in the form of a large ethmoid cell growing out into the concha media. This cell, like any of the ethmoid cells, may occasionally become the seat of a mucocele or an empyema. The existence of the concha bullosa is not in any way the result of the mucocele or the empyema.

The cells of the ethmoid labyrinth are in close relation to the orbit. In the first place, many of these cells are separated from the orbit merely by the thin orbital or paper plate of the ethmoid. This relation is shown in Fig. 3. Again it is not uncommon to find ethmoid cells which extend out along the upper wall of the orbit. These supraorbital cells of the ethmoid come necessarily into close relation with the orbital extension of the frontal sinus, the two being separated by a

thin partition of bone. If a sagittal section be made in such a case, through the frontal sinus and the orbit, this plate separating the orbital ethmoid cells from the orbital extension of the frontal sinus will appear in cross section (see Fig. 8). Sections showing this condition have frequently been described as illustrating the existence of compartments in the orbital extension of the frontal sinus, whereas such compartments usually represent supraorbital ethmoid cells.

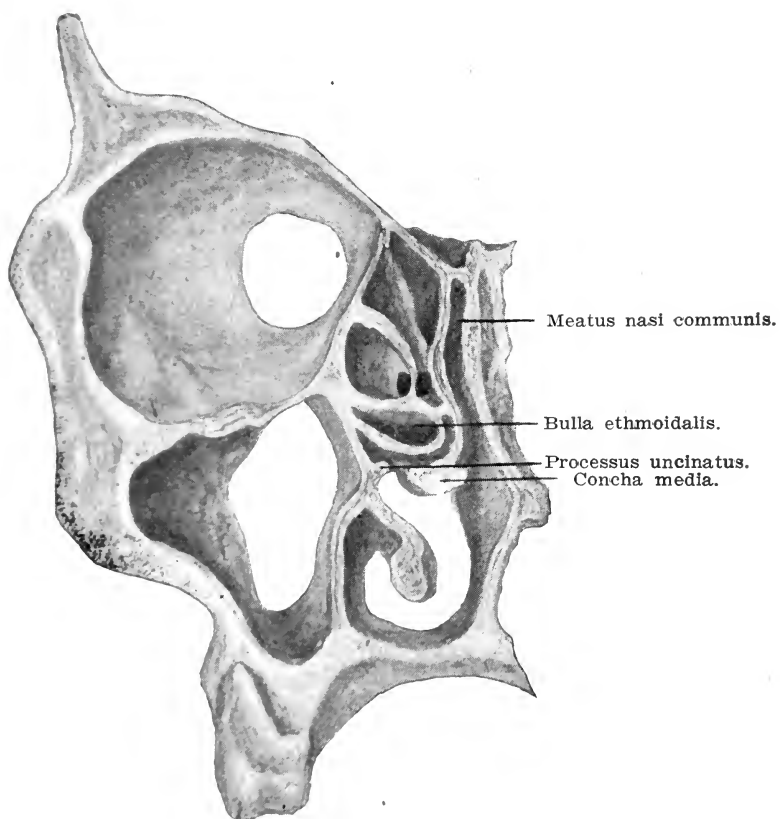
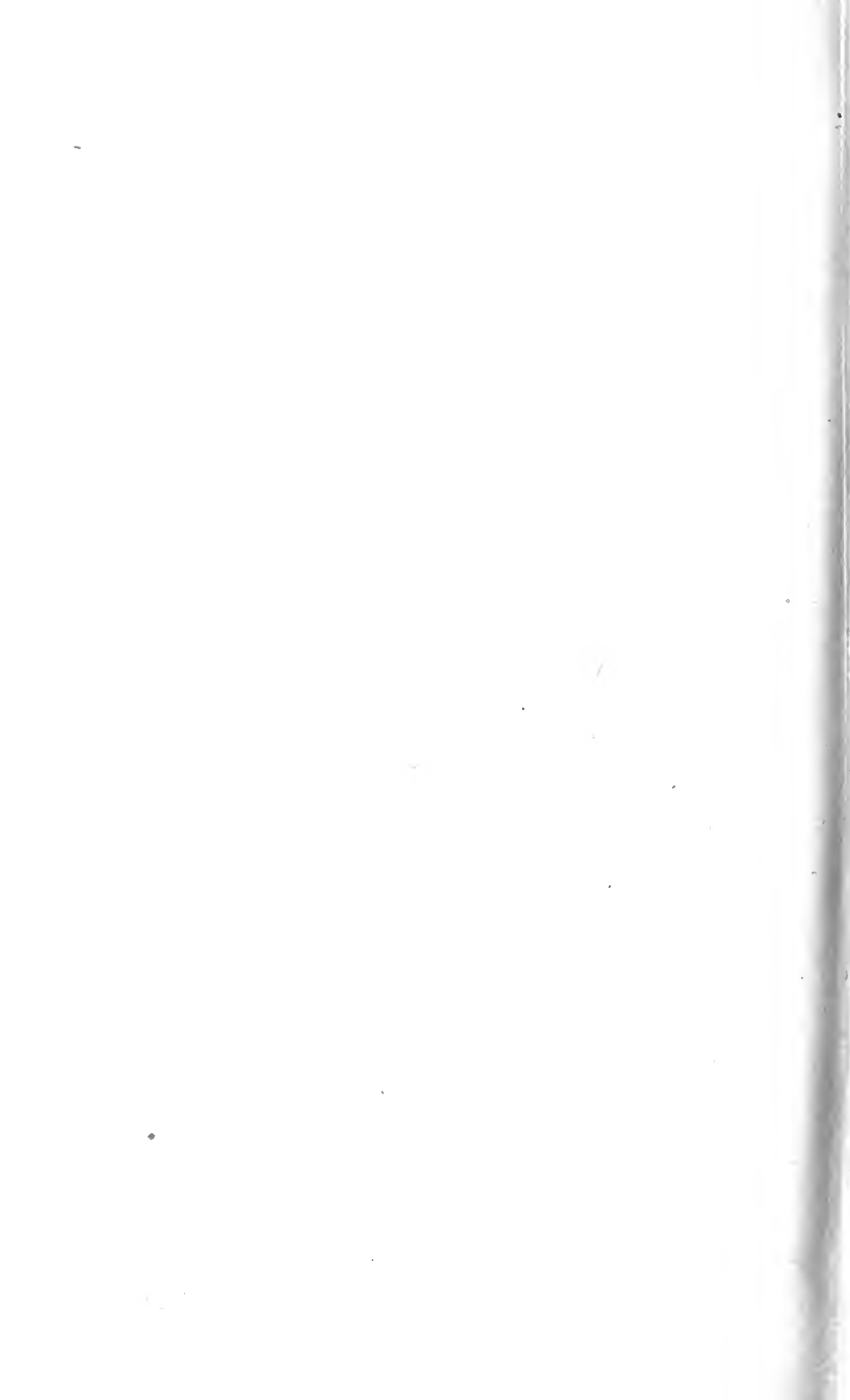


Fig. I.

Frontal section showing right side of nose. Cross section through the ethmoid labyrinth.



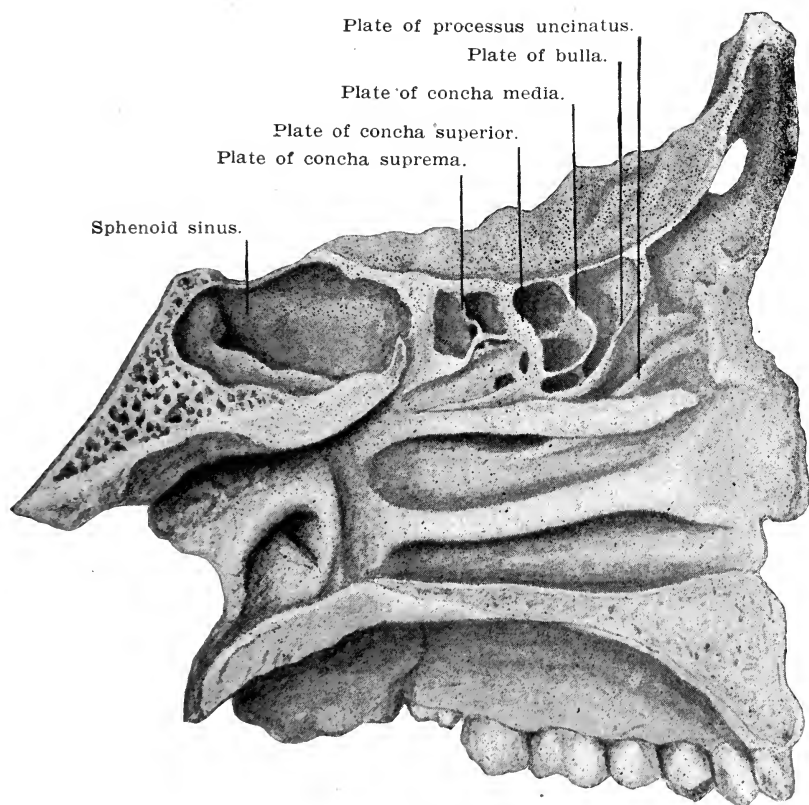
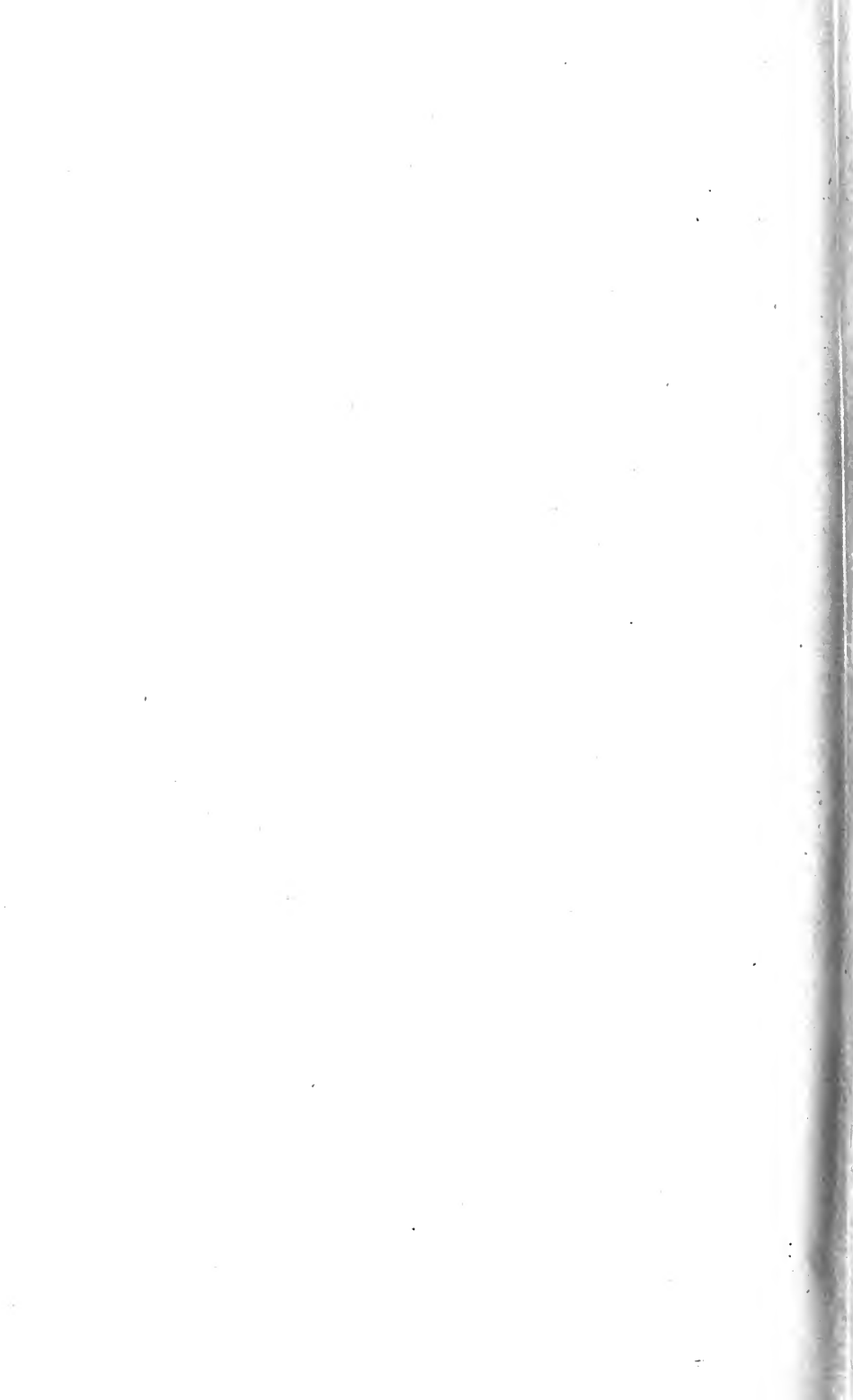


Fig. II.

Sagittal section showing left side. Preparation shows typical construction of ethmoid labyrinth; the several partition plates presenting an unusually simple form.



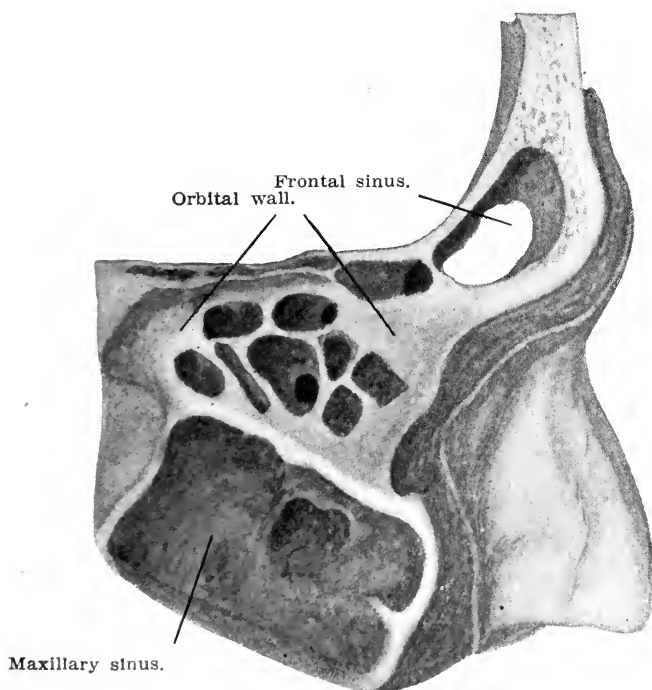


Fig. III.

Sagittal section through the orbit, section opening into the frontal sinus and maxillary sinus. The several ethmoid cells which impinge upon the paper plate of the ethmoid have been opened so as to show the relation between the cells and the orbit.

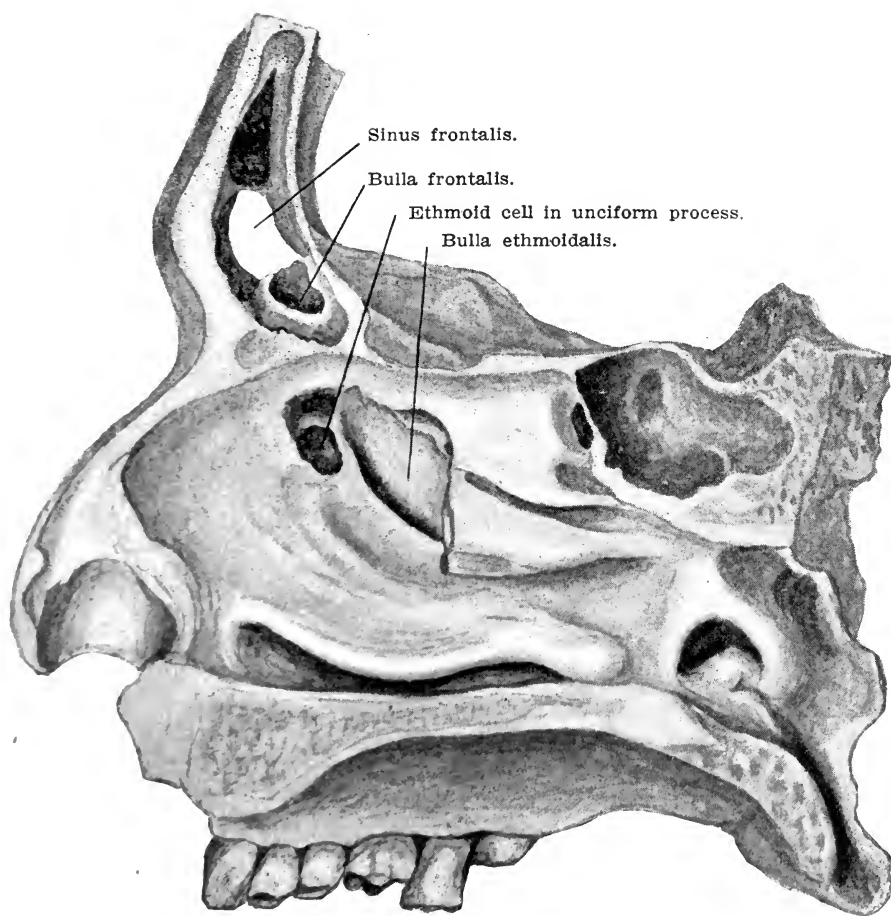


Fig. IV.

Sagittal section showing right side. The anterior half of middle turbinated body has been removed. The preparation shows a large ethmoid cell, which has been developed in the floor of the frontal sinus; also ethmoid cell in the unciform process.

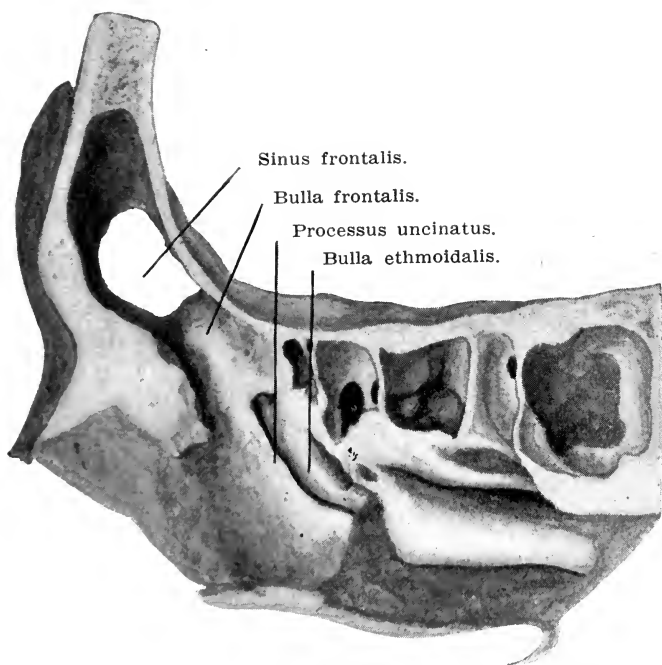
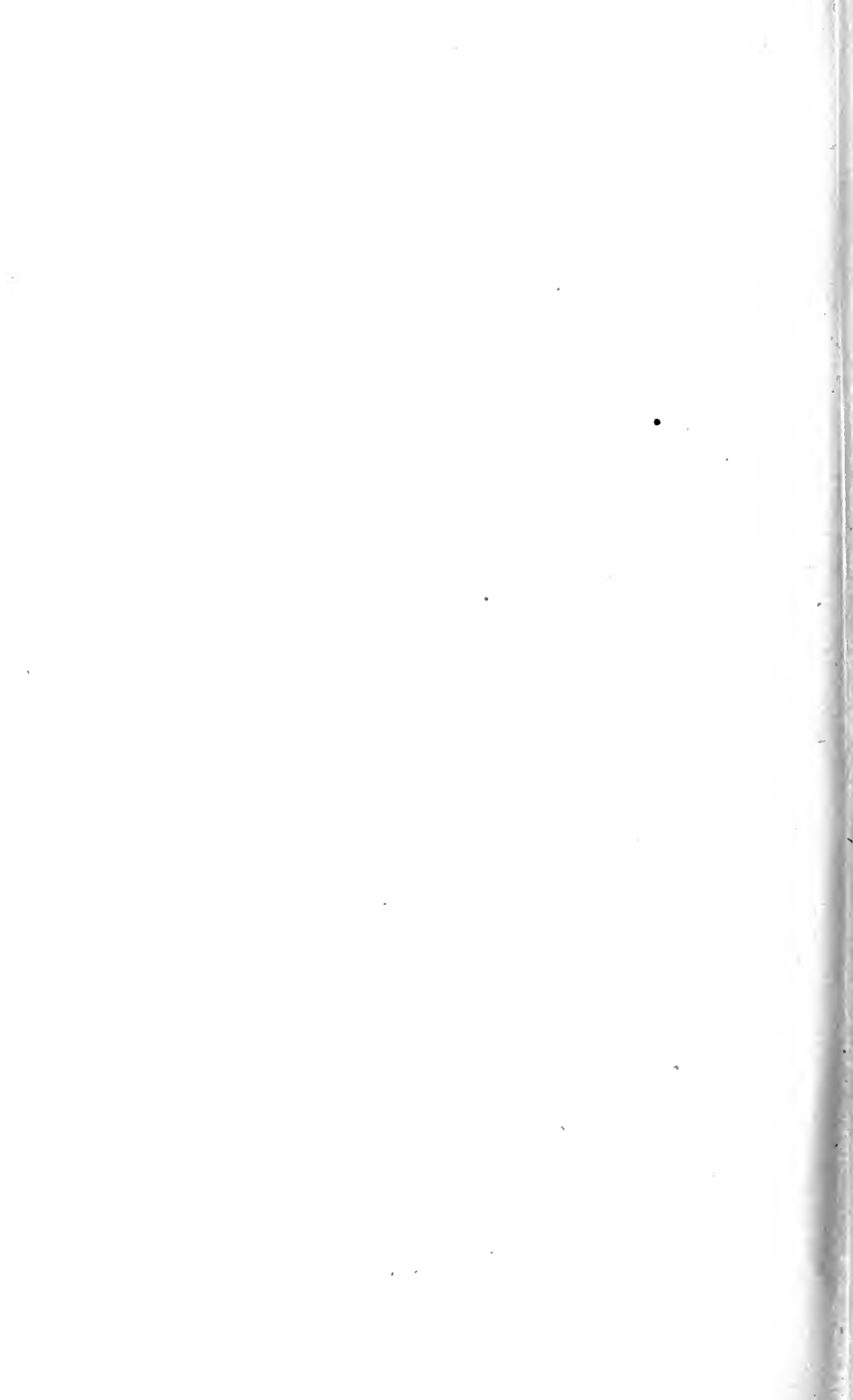


Fig. V.

Sagittal section showing right side; the anterior half of the middle turbinated body has been removed; the infundibulum, instead of opening into the frontal sinus, opens into an ethmoid cell which has developed in the floor of the frontal sinus; the opening into the frontal sinus lies to the mesial side of the infundibulum.



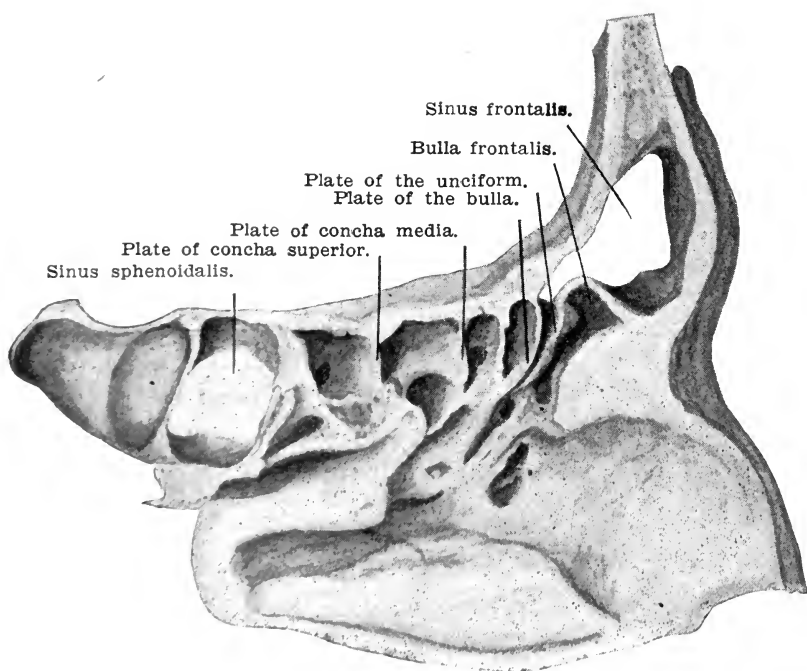


Fig. VI.

Sagittal section showing left side. The anterior half of the middle turbinated body has been removed and the ethmoid labyrinth has been opened up; the preparation shows an ethmoid cell which has developed below the unciform plate, pushing this up into the frontal sinus, where a bulla frontalis is formed; the other plates of the ethmoid are formed as usual.

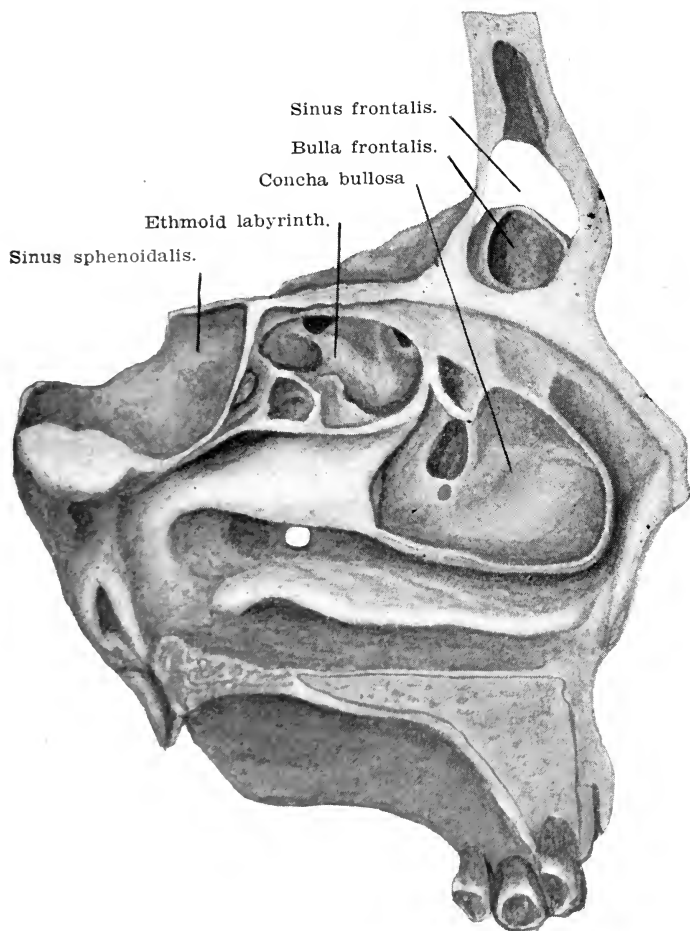


Fig. VII.

Sagittal section showing left side. The ethmoid labyrinth has been opened up; a large ethmoid cell is formed in the floor of the frontal sinus and an exceptionally large cell has developed in the anterior half of the concha media, forming the condition known as concha bullosa, also referred to as cystic enlargement of the middle turbinated body.

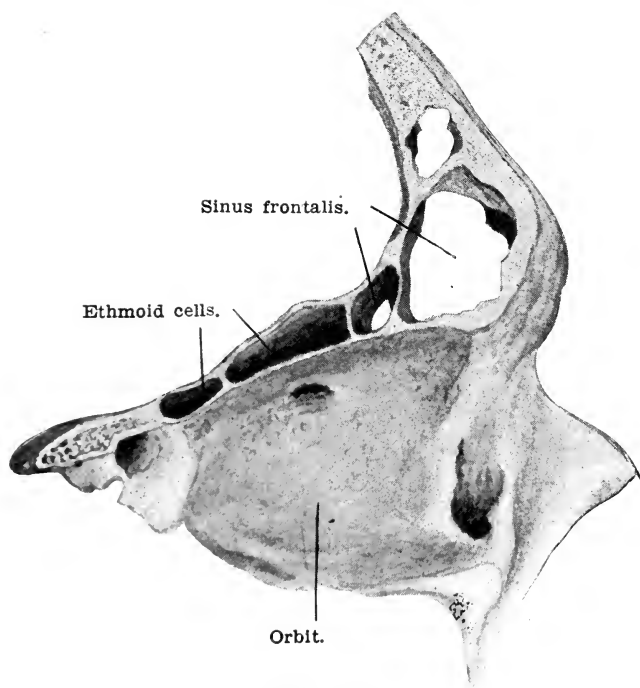


Fig. VIII.

Frontal section through the right orbit, showing sinus and ethmoid cells which have developed out over the orbit.

LII.

IS THERE AN IDEAL OPERATION FOR THE CORRECTION OF DEVIATIONS OF THE NASAL SEPTUM?

BY JOSEPH S. GIBB, M. D.,

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Ever since rhinology has taken its place among the special lines of study, septal deformities have been of all-absorbing interest. That the subject is not of easy solution is manifest from the innumerable operative procedures suggested for the correction of the same—procedures which are along divers lines.

A casual glance at the long list of measures suggested and the description of the defects to be corrected, convince one of the utter lack of unanimity of opinion.

Almost every author views the septum and its displacements from a different standpoint, hence their descriptions vary. To one unfamiliar with rhinologic lore, it would be difficult to recognize in any two descriptive operative measures designed to correct the same deformity much similarity in the preliminary description of the anatomic or rather pathologic position of the parts. For example, the description of the common forms of deviation as portrayed by Killian would scarcely be recognized as the same as those of Freer. Hajek looks at a septal deformity very differently from Krieg or Boennighaus.

What does such a lack of uniformity indicate? Surely not a want of accurate knowledge on the part of these men. They are all careful, conscientious, painstaking and patient workers in the field of research. Rather does it show that the form the septum may assume because of interference with the proper and normal development, or as a result of traumatism is so varied as to baffle accurate description. Doubtless each observer sees just the condition he describes, and just as truly no one sees them all. While it would be a matter of incalculable value to have a description which, while simple, would cover every possible shape and form the septum may assume, because of conditions which prevent normal development or distort it after it has been so formed, still the practical point, which is too frequently overlooked, is to determine in what

manner the distorted septum interferes with the proper function of the nasal chambers. It matters little from a practical standpoint whether the deviation is bow-shaped, S shaped, horizontal or vertical.

It is, however, a matter of much importance whether or not the deviation is in such a position or of such shape as to interfere with nasal respiration, or to obstruct the outlet from the various sinuses, or exert pressure upon sensitive nasal nerves. As indicated above, no one description can possibly serve as a guide for the study of septal deformities. The modern rhinologist must learn that each case is a law unto itself, and must be carefully and closely studied and if operative interference is demanded at all, that one selected which will give the most reasonable prospect of restoring, not the septum, but the nasal chambers to their normal functions. In order to accomplish this it is quite as important, perhaps even more so, that the posterior as well as the anterior portions of the chamber be the subject of investigation. Not infrequently we find marked deviation of the bony structures, either of the perpendicular plate of the ethmoid or of the vomer, even to the point of complete nasal obstruction, while the cartilage remains little if any out of its normal position.

It would seem in these days, when rhinologists have gone operation mad, an unnecessary refinement to point out or caution against the possibility of overlooking deformity in this body. Rather would we subserve the best interests of our art by uttering a word of caution against indiscriminate and unnecessary operation.

In this particular the writer is in entire accord with those who sound a note of warning. Swain has in graphic language refreshed our minds as to the real functions of the nasal chambers and given a word of warning as to the danger of our becoming nasal carpenters.

It seems to the writer that, in the nasal chambers as in other portions of the human frame, the point to determine is whether or not the malformation interferes with the function of the part, and if it does, what operation is best calculated to overcome the difficulty? If we have conscientiously settled this point we have gone a long way towards doing our patient a service.

In reviewing the operations which have been from time to time advocated to correct deviations of the septum, one is struck with the varied objects these operations have in view.

The early operations, e. g., the stellate punch, Robert's pin, Harrison Allen's supralabial and others, had but a single object; namely, to bring into a straight line a cartilaginous septum which from causes known or unknown had deviated from this position. With the possible exception of Allen's operation these methods took no thought of the bony septum or considered the presence of redundant tissue the result of inflammatory action. At the period these operations were in vogue little attention was given to the deeper nasal tissues, enough was accomplished it was thought, when the cartilaginous septum was brought into a position near the median line.

Later operations, designed by Asch, Watson, Gleason and others of the same general type, sought in addition to correcting the position of the cartilage also to make an effort to obtain the same result with the bony structures, which were known to have suffered as much as those more anterior. Also these operators saw the necessity in order to secure substantial results to take into consideration the redundant cartilaginous and bony tissues which filled in the concavity of a deviation or surrounded the site of a fracture, usually situated at the junction of the cartilaginous and bony framework. An effort was made to dispose of this redundancy of tissue in such a way that it would not obstruct the respiratory channel.

In all these earlier methods the desire of the surgeon was to effect a readjustment of the displaced parts with as little destruction or removal of the normal tissues as possible.

The object was much the same as the general surgeon has in view who endeavors to correct vicious union in a long bone by refracturing it and replacing the fragments in as nearly a normal position as is possible to get them.

The modern operation—the submucous resection—as practised by its many advocates,—notably Killian, Hajek, Krieg and Boennighaus in Europe, and Freer, Ballenger and White in America—is designed upon lines totally different from all former septal operations. This method sees in the distorted tissue, be it cartilage, bone or adventitious product, the result of inflammatory action—an obstruction to be removed—and if it interfere with nasal function is resected from between the layers of the overlying mucous membrane.

In this rapid and cursory review of the salient features of the operations designed for the correction of deviated septa, it will be seen that all the older methods sought to preserve intact the septum.

The modern operation—the submucous resection—has no such object in view. The septum is regarded as the offending body and no effort is made to preserve it. Claims are made that from an anatomic or physiologic standpoint this tissue is unimportant, and hence no harm will result from its ablation. Therefore, if it is necessary in order to secure a free and unobstructed naris, the cartilage or bone be removed, this is done without hesitation.

With a view of ascertaining the advantages of the submucous operation, the writer began the use of this method about two years ago.

Previous to this period each case was studied in its entirety and that operative procedure employed which seemed to offer the best opportunity of restoring the nasal chambers to their normal functions.

The desire in view was to accomplish this result with as little interference with the structures as was possible. In cases in which the removal of an enchondrosis or exostosis gave promise of obtaining sufficient space to secure good nasal respiration or relieve pressure, this simple operation was done, and the septum undisturbed.

If after a careful study of the case it did not seem possible to secure the result by the simple manner detailed, then one or other of the various operative procedures upon the septum in vogue at the time were employed.

In the earlier years the Robert's or Adams' operation and later the Asch, Watson, Gleason, or those of the same type, were among those selected.

While complete success did not always crown our efforts still there was a fair measure of it.

In a paper* upon this subject read at the American Medical Association, in June, 1904, the writer selected 100 cases and tabulated the results as follows:

Total number of Asch operations	65
Total number of Watson-Gleason operations.....	23
Total number of spurs removed operations.....	12
Of the Asch operations:	
The result was good in	47

*Gibb, J. S. Deviation of the Nasal Septum. A review of 100 operations for correction. Trans. Sec. Laryngol., Am. Med. Assn., 1904.

The result was fair in	11
The result was failure in.....	3
The result unknown in	3

In one case of failure by the Asch a successful result was obtained later by the Watson-Gleason.

Of the 23 Watson-Gleason operations:

The result was good in	19
The result was fair in	3
The result was failure in	0
The result unknown	1

There were twelve cases in which it was deemed sufficient to remove only an exostosis or enchondrosis, and of these all were successful.

It was not claimed that a perfectly artistic result was secured, that the septum was made to follow an absolutely straight line, but what seemed to the writer more important in those cases marked with good result, the respiratory function of the nasal chamber was restored or pressure removed or both.

In passing, it is to be noted that of the 47 Asch operations nearly all were plain cartilaginous deviations, while the Watson-Gleason were combined osseo-cartilaginous.

Since the writer first began the use of the submucous resection method, he has employed it in 25 cases—not a large number, to be sure, but sufficient to form a basis for comparison. In many respects this method is immeasurably superior to any operation which has yet been devised for the correction of deviated septa; that it is a perfectly ideal operation and adapted to every septal deformity the writer does not admit. This method far surpasses any of the older ones in the simplicity of the after-treatment. Again it is superior for the reason that when skillfully performed it ensures a perfectly straight septum, one that cannot possibly revert to its former faulty position. These are weighty arguments in its favor.

However, there are equally strong arguments against the universal application of this method. (1) It is an operation difficult to execute and success will result only in skillful hands. (2) It requires for its accomplishment a much longer time than is necessary for any of the older methods. (3) Which is dependent upon the (2), it is a severe strain upon the endurance of both patient and surgeon. None of these criticisms are offered to disparage the operation, but merely to place them side by side with less radical procedures in those

cases in which it might be thought feasible to employ mild measures.

The writer disclaims any spirit of harsh criticism of this method, and he doubts that serious consideration would be given him if he did, since praises are raised to this new method in every medical journal, book and society in the land. The operation has come to stay and is an immense advance in our knowledge of septal surgery. It is believed, however, wise to sound a note of warning against the indiscriminate use to the exclusion of all other and well tried plans of septal improvement.

In skillful, judicious hands it will prove a great boon to suffering humanity. In unskillful, bungling ones it will be a curse.

Already cases are coming to our notice where this operation has been attempted which would have been better had no operation been performed.

Teachers assume a grave responsibility when they recommend this operation to their classes without at least a word of warning as to the difficulties, and perhaps coupled with the advice to the tyro to first perfect himself in the technic upon the cadaver or lower animals.

From the fact that from time to time new operations have been designed to correct septal deformities, it may be well argued that previous attempts had not given universal satisfaction. As with incurable diseases the number of remedies are legion, so with deformities of the septum surgeons have not been satisfied with the efforts of their predecessors, and have ever striven to design a method that would be ideal—hence the number of operations have multiplied in the effort to attain this goal. Has this Utopia been reached? The advocates of the submucous resection method believe that it has and that every conceivable form of septal malposition may be corrected. Doubtless in extra-skillful hands this statement is strictly true—but it is only a partial truth as to the claim that the operation is ideal. Granted that in the hands of a master, a deviation may be dissected out from its encompassing mucous membrane, it may not always be the part of wisdom to so dissect it. For example: It is no uncommon experience to find a septum deviated only in its posterior bony portions. The perpendicular plate of the ethmoid, the vomer and the maxillary crest, each or all participating in the deformity,—and the

latter surrounded by new tissue the product of inflammatory action, either cartilage or bone according as one or other of these tissues is the site of the initial inflammatory process, the whole forming a mass which entirely prevents free nasal respiration. Given such a case, is it the part of wisdom to remove a perfectly normal tissue, one that is in nowise productive of harm, in order that an offending, obstructing mass may be reached and removed? This question could well be answered in the affirmative if there were no other way,—but that this is not the case is attested by the army of rhinologists who have successfully laid siege to and conquered these conditions long before the advent of the submucous method. Force, again, is added to the argument against the wanton destruction of normal tissue, from the fact that all the advocates of the new method admit the exceeding difficulty of stripping the mucoperiosteum in the posterior deviations. So peerless an operator as Freer* advises the operator to persevere with the resection of the bone at this point and not to allow the fear of a tear of the mucous membrane or a perforation to cause him to desist in his efforts. The older methods could do no more injury than tear the mucous membrane, or cause a perforation, and in the latter method the septum would remain intact—a very important consideration notwithstanding the assertion that the cartilaginous septum plays but a feeble role in sustaining the tissues of the bridge.

Of course in those cases in which the bony deviation is associated with a marked cartilaginous bend, these criticisms would not be relevant, since the one may not be satisfactorily corrected without the other, and it would seem wiser to allow one operation to suffice for the entire deformity. But even in this latter, in consequence of the extreme difficulty in effecting thorough stripping of the periosteum from the bone, the embryo or unskillful rhinologist had better select some less difficult, though perhaps also less efficient, method until he has acquired sufficient skill to make a successful result measurably sure.

Nor is this particular type of deviation the only one in which the submucous resection operation appears an unnecessarily harsh one. A very common deviation is a bowed cartilaginous septum with no change in the bony structures.

It is at once admitted that these are readily corrected by the submucous operation, and that they are comparatively easy

*Freer. *Annal. Otol., Laryn. and Rhin.*, June, 1905, page 242.

of execution. But it is also just in these cases that any one of several of the older methods of operating have scored signal successes.

It is believed that the poor results of the older methods which seemed to necessitate the application of newer and better means arose from a lack of appreciation of the influence of the bony structures in reproducing deformities which were believed to be thoroughly corrected.

Further, the writer believes that were deviations confined alone to the cartilaginous septum, the older methods would have sufficed and there would be no need of the submucous resection.

In this type then, while it is conceded the submucous operation gives excellent results, it seems to the writer that at least in properly selected cases, it is an act of folly to discard those methods which have served us so well in the past—and that it is better surgery to save the cartilage and effect by simple means the results we desire.

Shall we then abandon all our old methods for the correction of septal deformities and adopt only the new? Have we an ideal operation?

If we are correct in our premises that the subject of septal deformities is so complex as to baffle accurate description as to the conditions to be overcome, manifestly no one operation can be relied upon to correct them. For a quarter of a century measures have been employed with more or less success. We should, with this experience, have been taught lessons which should enable us to determine in what class of cases success might be looked for, and those in which success seems improbable, adhering to the old methods in the former and relegating the latter to the newer.

An effort has been made to point out a few conditions in which it is believed as good success may be attained, with less destruction of tissue, by the older methods. There are many others. In view of the multiplicity of abnormal shapes and positions a deformed septum may assume, each case must be a study in itself, and the surgeon select that operative procedure which his experience and individual judgment has taught him is best suited for that particular case. While it is admitted that many, if not all, deviations may be corrected by the submucous resection, it is denied that it is a good surgical procedure to resort to it in every case.

Therefore it is believed to be unwise to abandon all the

labors of our predecessors, many of which have stood us in good stead in the past and take up with new. Rather does it appear more judicious to welcome the new as a great addition to our means of attacking this difficult and intricate subject, helping us out of many difficulties in which we were formerly helpless, but at the same time holding fast to the old well-tried and satisfactory methods.

The writer trusts he has been able to make himself perfectly clear on the points at issue. He disclaims any desire to disparage or attack the submucous operation. On the contrary, he has been filled with admiration of the conception of this operation and of the results obtained in the hands of the little band of expert operators throughout the world who have enthusiastically advocated its claims. The thought is that harm will surely result from an indiscriminate endorsement of this truly brilliant procedure unless an attempt is made to give it the position it deserves in the surgery of the nose. The writer is conscious of the fact that the attempt to so place it is feeble, but he also believes that ultimately and in abler hands it will be so placed and result in inestimable benefit to mankind.

From what has been said we are in a position to answer the question—is there an ideal operation for the correction of deviated septa? And it must be in the negative.

The conclusions reached are:

1. There is no single operation devised which will correct every form of deviation of the nasal septum.

2. The shape and position of the septum resulting from deviation is so various as to make accurate description difficult, if not impossible.

3. The object of operation upon the septum should be correction sufficient to restore the normal functions of the nose with as little destruction of tissue as possible.

4. Each case must be a law unto itself and studied carefully and in its entirety.

5. In many cases the object sought, namely, restoration of nasal function, may be attained by the removal of exostoses or enchondroses and the septum left intact.

6. Other cases may be corrected by one or other of the older septal operations, the selection of which depend upon the individual preferences of the operator.

7. Still others can be best corrected by removing the septum entire according to the submucous method.

LIII.

PATHOLOGY OF THE FAUCIAL TONSIL.

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The assignment of a topic upon the pathologic conditions of the tonsil presents a field most comprehensive in its scope, but its fortunate limitation to a surgical symposium in certain degree diminishes this range. While the tonsil is comparatively simple in histologic structure, its important position at the alimentary inlet, close relation to cervical lymphatics, remarkably free vascularity, and exposure to constant impact from foreign material, render it anatomically and functionally of considerable significance.

These minor groups of adenoid tissue comprising the so-called adenoid ring, omnipresent and familiar almost to a degree of contempt, save in relation to this anatomic interference and retardation of functional development, still in large measure defy scientific investigation as to their exact import in the body economy, and still leave indiscriminate surgical interference a question of justifiable debate.

Most admirable and painstaking work has been done upon this investigation by Packard, Wood, Swain, Wright, Browne, Hall, Tilly, Kyle, Allen and others, yet notwithstanding their splendid contributions to this field of literature, the tonsillar function still remains a matter of opinion.

In view of noteworthy studies already published on cryptal degeneration, lymphogenetic function, tubercular significance, focal areas for bacteria, vasomotor connection, etc., it would seem best in this paper, after brief outline description of anatomic and physiologic characteristics, broadly to classify and describe pathologic conditions present, and finally, perhaps, discuss in more detail some special topic of practical application in the routine surgery of this part. Inasmuch as chronic hypertrophy and its resultant effects are most significant upon general metabolic activity, the progressive change of the tonsil during the developmental period would

perhaps be primary in importance, and next in order the systemic effects of cryptal absorption.

SUGGESTED ORDER OF STUDY.

1. Brief review of anatomic and physiologic characteristics.
2. Classified description of pathologic conditions acute and chronic.
3. General effect of hypertrophic enlargement in the nasopharyngeal area.
4. Correlated physiologic influence upon general metabolism.
5. A comparative study of hypertrophic changes at stated age intervals.

Anatomically, the faucial tonsils, lying just internal to the angle of the jaw, between the palatoglossus and palatopharyngeus muscles, consist of a mass of glandular tissue, flattened ovoid in shape, of the type of compound lymphatic glands, and in early life about three-quarters of an inch in general dimension. Each tonsil contains from twelve to fifteen cryptal orifices, formed by invagination of the epithelial layers of mucous membrane, and from these crypts numerous irregular communicating channels branch out into the subjacent parenchyma. In the walls surrounding the crypts are found numerous nodules, without, however, directly communicating ducts, the contents being discharged directly through the epithelial walls of the crypt. The pharyngeal surface of the tonsil is indurated from constant foreign impact, and the crypt mouths become partially occluded by cicatricial bands of fibrous tissue in later life. The mass is closely adherent to the superior pharyngeal constrictor, often adherent to anterior and posterior pillars. Harrison Allen has called attention to the almost uniform presence of a sulcus dividing the lower smooth from the upper cryptose position and a posterior velar portion. According to Piersol, the epithelium lining of the crypts becomes completely infiltrated with lymphatic cells.

Beneath the indurated cortex, a much softer parenchymatous portion exists, and closer study of lymphoid follicles shows analogy to Peyer's patches and solitary glands of the intestine. Within the crypts the epithelium shows marked degenerative changes, and in adult life small cheesy pellets are often present, formed from accumulated secretion, and from time to time ejected.

Attention should be called to the supratonsillar fossa upon

and back of the tonsil covered by the plica triangularis, inasmuch as this is a most important pathologic focus.

The vascular supply is derived from the tonsillar, lingual, faucial, internal maxillary and pharyngeal arteries—and the nerve control by branches from the trifacial and glosso-pharyngeal.

Of important significance is the lymphatic outlet into upper deep cervical nodes, lying along the internal jugular vein, and thus communicating with the axillary and superior mediastinal spaces. Its embryologic development has been most diligently studied by many authors, but is without the province of this paper.

In anatomic summary, then, tonsillar points of interest are:

1. Mucous membrane and crypts.
2. Interfollicular tissue.
3. Lymphoid follicles and nodules.
4. Fibrous tissue stroma.
5. Vascular supply.

Physiologically the tonsil presents a far more difficult problem as the data available on functional importance are meagre, and many authors merely consider these glands adjuvants to salivary work in deglutition. Wood, who has carefully covered this field, emphasizes the lymphogenetic possibilities; others the phagocytic, absorptive, etc.

Inasmuch as the tonsils contain closed lymphoid follicles, a first inference would be that they should be included in this category of the so-called ductless glands and be estimated with the thyroid, suprarenal and others. Indeed, their embryologic relations with the second branchial cleft would strengthen this assumption. Yet a study of the secretion fails to reveal anything commensurate with the renal, colloidal and other associated fluids. Its contribution to the saliva and lymphatic manufacture, partly chemical and partly physical in importance, probably limits its field in this direction.

The fact that toxemic and other materials are frequently absorbed through the crypts would bring next consideration to its possible share in alimentary absorption and nutrition. Its connection with the lymphatic channels is certain, and this possibility is not remote, yet its surface is so comparatively small and extirpation shows so little disturbance that it seems almost inconsequential.

It has been suggested that the tonsils through moderate

vasomotor reaction may serve some part in protecting the pharyngeal cavity by influencing secretion. This, again, has no corroboration.

Inasmuch as the throat first receives pathogenic matter admitted to the system per oral cavity—its protective and possibly antitoxic properties should be considered. Epithelial tissues in general have a positive selective resistance to toxic absorption, and the constant formation of leucocytes would indicate phagocytic action. The alimentary mucous membrane, universally glandular in type, preserves this resistance in uniform degree, as per evidence of the immunity to ptomain contact in the intestines, and it is entirely possible that the free display of adenoid tissue in and about the pharyngeal cavity, and particularly in the tonsil with its specialized tissue formation, may contribute to this capability of resistance.

Newcomb has called attention to the constant rarefaction in the epithelial surface of the crypts as the tonsil atrophies, allowing various organisms to pass through the thin walls, again strengthening the theory of protective function during the period when all adenoid tissue is most marked.

In experiments upon colors rubbed into the hypertrophic tonsils, Goodale found them taken into the interfollicular space but not into the follicles; and attention has been called to the free phagocytic migration from the center to tonsil surface functionally protective in destroying septic organisms so prevalent in the mouth.

2. CLASSIFIED DESCRIPTIONS OF PATHOLOGIC CONDITIONS, ACUTE AND CHRONIC.

The variance in terminology renders a definite classification of tonsillar affections somewhat difficult. By many authors the term lacunar has been substituted for the appellation "follicular" customarily applied to such common condition of the tonsils, as distinguishing the cryptal inflammation from that involving lymphoid follicles.

A simple classification based as much on symptomatology as microscopic change might be as follows:

(a) *Acute.*

Inflammatory, superficial or catarrhal tonsillitis.

Lacunar or cryptic tonsillitis.

Peritonsillar abscess.

Acute ulcerative tonsillitis (rare).

Membranous tonsillitis.

Herpetic tonsillitis.

(b) *Chronic.*

Chronic hypertrophy of the tonsils.

(a) Fibroid.

(b) Soft adenoid enlargement.

Chronic lacunar tonsillitis.

Mycotic inflammation of the tonsils.

Tonsillar calculi and foreign bodies.

Traumatic and escharotic affections.

Rheumatoid tonsillitis.

II. *Neoplasms.*

(1) Benign tumors of the tonsils.

Papillomata.

Fibromata.

Angiomata.

(2) Malignant tumors.

Carcinomata.

Sarcomata.

In addition, cases of lipomata and lympho-sarcomata have been reported.

In all these various degrees of acute and chronic inflammation of the tonsils, the bacterial germs most frequently involved are the pyogenic cocci, but these will be considered in the discussion of inflammations.

Acute Types.—1. In acute catarrhal or superficial tonsillitis, as termed by Kyle, the inflammatory condition is that of a simple glandular mucous surface. First, distention of blood vessels; second, exudation of fluid and diapedesis of cellular elements from central current, and third, various degenerative changes in proximal fixed tissues and proliferation of tissue cells.

This simple inflammatory condition, with customary symptomatic changes of increased temperature, redness, thickening and modified nutrition, may undergo resolution or advance into more defined lacunar types, producing surface necrosis or involving deeper reticulated and lymphoidal structures of the tonsil.

In these inflammatory stages we note the marked phagocytic effort of the leucocytes to resist pathogenic microorganisms, by massing themselves about, absorbing and digesting toxic elements.

2. Acute lacunar (often termed follicular tonsillitis), like

the catarrhal form in advanced stage, is characterized by considerable accumulation of inflammatory exudate in the crypt passages. This includes epithelial cells, leucocytes, bacteria, and various forms of debris, and in the chronic stages, masses of keratoid material formed by epithelial degeneration. Associated with this will be found a marked degree of cell proliferation in adjacent tissues, and inflammatory exudate into the parenchyma, producing infiltration of leucocytes and an edematous condition of adjacent glands.

Paterson and Sawtelle demonstrated that the supratonsillar fossa which has almost direct connection with superior crypts and follicles, was the seat of primary entrance for tonsillar infection.

Microorganisms' presence in the tonsils have been investigated by many authors.

Streptococci, both forms, staphylococci (aureus and albus) and the diplococcus predominate; in lesser frequency the pneumococcus, Klebs-Löffler bacillus, staphylococcus citreus, micrococcus tetragenus, micrococcus albus liquifaciens, leptothrix fungus and others more sporadically. The essential qualifications for most bacterial growth are here present in the deeply lying crypts—warmth, moisture and nutritive pabulum, augmented by inflammatory change.

It has been shown by recent research that the tonsil is often the seat of primary and secondary tubercular deposit, while in general rheumatic fever and the exanthematous diseases, the tonsillar condition is primary in many cases.

Allusion might here be made also to the specific infection of syphilis and its attendant chain of ulcerative and necrotic conditions.

3. Parenchymatous tonsillitis. Beyond the cryptal structure of the tonsil we find secondary isolated nodes with an inner follicular parenchyma, and this divided by fibrous trabeculae passing in from the capsule and carrying vessels. Associated with lacunar inflammatory change, this entire parenchymatous mass may become involved with characteristic exudate. This may readily resolve in time to tonsillar abscess with deep encysted pockets.

4. Peritonsillar abscess is closely allied to the general parenchymatous inflammation, in fact abscess of true tonsillar tissue most often commences in the peritonsillar area.

According to Shurley, the first step in peritonsillitis is de-

termination of the blood to the tissues caused by toxic action on blood vessels. In fact, anything seriously disturbing relations between internal and external capillary circulation may be an exciting cause.

Peritonsillar abscess or quinsy is so familiar to specialists and general practitioners as to require little description. Its process is essentially inflammatory, involving surrounding pharyngeal and lymphatic tissues; a rapid infiltration and cell proliferation, marked effusion from vessels and lymphatic channels, leucocytes subject to chemotaxic attraction. Necrosis takes place and abscess points, in line of least resistance, spreading freely if in outer thin tissues, but often requiring deep incision through body of tonsil when confined to tonsillar structure proper. The tonsillar cyst has also been described in this connection.

5. Acute ulcerative tonsillitis per se is infrequent and is closely allied to necrotic areas secondary to aphthous deposit and the small ulcerations left upon removal of herpetic blebs.

6. The membranous or aphthous is very similar to membrane produced by the Klebs-Löffler bacillus. The membranous deposit is continuous with that in the crypts, and may spread over the entire tonsil and neighboring pillars. It is in form a coagulation necrosis, producing surface ulceration of varying depth.

Superficial layers of mucous membrane are infiltrated with pus cells, exudate and bacteria. It consists of grayish membrane, often bleeding if detached, and often an exanthematous complication. As has been noted, non-pathogenic bacteria become pathogenic under such conditions of weakened tonsillar resistance.

7. Herpetic tonsillitis was early described by Moure of Bordeaux as consisting of small vesicles which break in twelve to twenty-four hours, leaving ulcers covered with whitish exudation. It is likewise a coagulation necrosis of surface epithelium with vascular exudate.

The tonsillitis due to rheumatic diathesis is so closely allied to the catarrhal and parenchymatous types that we have not here given it special classification.

1. *Chronic Types.* The omnipresent chronic hypertrophy of the tonsils may be either the true hyperplasia of all tonsillar structures or a hypertrophy of the connective tissue elements. It is an almost invariable sequence to repeated attacks of acute

tonsillitis and probably has been most often investigated of all pathologic conditions.

The appearance of the hypertrophied tonsil is characteristic. A large lobulated mass projecting well beyond the margins of the pillars with crypts freely visible, contracted or open in accordance with the age and progression of hypertrophy.

Lennox-Browne classifies these forms of hypertrophy as 1. Peninsulated or projective. 2. Cowled. 3. Lacunar, honey-combed or ragged, and in morbid anatomy as—1. Interstitial or sclerotic. 2. Lymphoid.

Bosworth thinks one-third to one-half of this number of cases arise from infectious diseases and places the etiologic order: first, scarlet fever; second, diphtheria; third, measles; fourth, smallpox. Unilateral hypertrophy has frequently influenced suspicion of syphilitic origin or development of neoplasm.

Unquestionably the diathetic or strumous diathesis and the exanthematous diseases are in large part causative of this condition. Suchannek claims that infection most often begins in Waldeyer ring, especially the faucial tonsil, and Packard reports five cases of endocarditis all preceded by attacks of amygdalitis.

According to Price-Browne, tonsillar hypertrophies are due to: 1, congenital causes; 2, diathetic conditions; 3, exanthematous diseases; 4, congenital syphilis, rheumatism, etc.

Its actual pathologic change consists, as stated, either in general hyperplasia of all glandular elements with cell proliferation and infiltration, or marked overgrowth of fibrous tissue, trabeculae and subsequent contraction. Its associated pathologic influence will be discussed later.

2. *Chronic Lacunar Tonsillitis.* This follows repeated attacks of the lacunar type, and inasmuch as the crypts are often partially obliterated by fine fibrous tissue trabeculae, caseous plugs of inspissated secretion (often keratoid mass) commingled with decayed food products and possibly bacteria, are found in crypt pockets. Often these are exuded as firm, almost osseous masses. (Wood claims a non-pathogenic state here.)

3. Mycotic inflammation is due to a fungous mass, essentially a form of necrosis, and usually arising from the crypt walls, though often spreading to the surrounding surface and even pillars. The leptothrix bacillus is usually causal and the condition is comparatively benign.

4 and 5. Calculi, foreign bodies, traumatic abrasion,

escharotic injury, etc., produce pathologic changes of acute and chronic inflammation respectively, and in this category might possibly be included drugs influencing inflammatory changes, such as mercury, antimony, potassium iodid, arsenic, copper, lead, zinc and belladonna.

In reference to calculi it has been maintained that the supratonsillar fossa is an especially vulnerable position for such concretions, that these vary from small specks even to an ounce weight, and resemble tartar on the teeth.

Gruening states that all tonsillar concretions contain leptothrix and that this influences precipitation of lime in form of chalk, while others hold that tonsillar calculi consist principally of phosphate and carbonate of lime.

Neoplasms have been especially well studied by Browne, Hall and Tilley and the older Continental investigators. It is sufficient here to allude to the main characteristics which resemble similar tumors in other glandular regions. Of the benign tumors the papillomata are wart-like excrescences emerging from the crypt walls or found at the supratonsillar portal. The fibromata are usually pedunculated or sessile, polypoid in appearance and likewise protrude from the crypt margin or adjacent tonsillar surface. In the malignant group carcinomata are of the epithelioma type, and may be squamous, columnar or alveolar, while sarcomata may be of simple type, such as round or spindle celled, and compound, as the angiosarcoma, lipoma and myxosarcoma (lymphosarcomata have also been reported).

The tonsils as portals of infection are elsewhere discussed in detail.

3. GENERAL PATHOLOGIC EFFECT OF HYPERTROPHIC ENLARGEMENT IN THE NASOPHARYNGEAL AREA.

The pathologic effect of chronic hypertrophy is almost directly that of respiratory interference.

Primary objective symptoms are localized functional obstruction, a muffled, nasal or cracked voice, difficult articulation, embarrassed deglutition, frequently a chronic hacking cough, high narrow palate arch, constricted nares, drooping lower maxilla with faulty dental alignment, vitiated sense of taste, smell and hearing, dull and listless facies, stupid expression and thickened lips, mouth-breathing and oral membrane impaired by exposure.

Of deeper and secondary significance are chest deformities,

such as pigeon or chicken breast, disturbed night rest with heavy snoring respiration, habit choreas and stuttering, fetid breath, increased susceptibility to bacterial invasion, increased tendency to contract bronchial affections, and general systemic malnutrition.

These and many other primarily functional and secondarily organic deficiencies, really pathologic in import, can be traced directly to the hypertrophied faucial tonsil.

4. CORRELATED PHYSIOLOGIC INFLUENCE UPON GENERAL METABOLISM.

Next should be considered the physiologic influence of this hypertrophy upon general metabolism.

Much of the foregoing enumeration rightly belongs to the category of this heading, but in addition emphasis should be placed on these points:

1. Direct relation of the tonsils to deep cervical nodes and general lymphatic system.

2. Remarkable vascularity in tonsillar mucous cortex and subjacent parenchyma.

3. Close relation to cervical sympathetics and consequent systemic influence of chronic irritation.

By reason of free vascularity, no nasopharyngeal area more readily responds to both local and distal venous engorgement, and consequent stasis and diapedesis produce secondary ulcerative and parenchymatous inflammation in quick sequence.

Through the cervical nodes directly, and through lymphatic channels, salivary glands, ethmoid and sphenoidal sinuses more remotely, even the axillary spaces and pulmonary orifices are vulnerable.

Close relation to both cerebrospinal and sympathetic nerve systems afford means for low grade neurotic irritation in the chronic inflammatory forms, and favor the severe algesia so distinctive of tonsillar and particularly peritonsillar involvement.

Again, a further important element in the consideration of tonsillar pathology, is the favorable focus the faucial tonsil presents for aiding the absorption of the many products of intermediate metabolic change in the albuminoid metamorphosis.

Granting the possibilities of salivary absorption, and also the dangerous probability of cryptic stasis and accumulation of semitoxic bacterial products, these degenerative changes may have a potent influence in producing the lethargic con-

ditions of the body attendant upon tardy elimination. Absorption of toxins accidental or experimental has proven moderately rapid. Granting again the more or less constant presence in tissue interstices, fibrous sheaths and reticular spaces of products of intermediate metabolic transition, etc., and for a limited space remarkable exposure in this area, why should not this metabolic influence be consequential?

It is difficult to locate the cause of discomforting growing pains of early childhood, the low grade lethargic states of systemic function, frequent states of mental dullness and apathy, dull mottled skin. Is it not plausible to assume that free absorption of toxins through degenerated cryptal contents may have at least some influence in producing and maintaining these retrograde katabolic changes?

5. COMPARATIVE CHANGES IN CHRONIC HYPERTROPHY.

It has been the writer's effort in outpatient service at the Children's Hospital, to study comparatively and statistically the systemic and organic alterations accompanying this most common malady. Unfortunately at the present time sufficient data of value have not been obtained for statistical report.

The relief from pharyngeal obstruction when such appears pathogenic, is marked and almost constant, but are there no fundamental grounds for judging hypertrophy and chronic lacunar tonsillar conditions, as essentially abnormal?

In consideration of this must be borne in mind the ready tendency to abrasion when hypertrophied, and consequent rapid absorption.

In connection with the paper the writer has been making comparative investigation of hypertrophic tonsillar changes at different age intervals. (This in conjunction with Dr. Scarlett, of the University of Pennsylvania.) Its purpose has been to ascertain if possible by sufficient ultimate averages the distinctive changes, particularly in the parenchyma of the tonsil. Data obtained, however, have not in average presented sufficient distinctive characteristics to warrant judgment. A number of slides have been obtained covering the marginal periods of normal adolescent growth, and a subsequent report will be forthcoming.

In general summary upon the all-important topic of tonsillar hypertrophy the following tentative conclusions will be accepted:

- a. The tonsils become permanently hypertrophied as a result of single or repeated acute inflammatory changes.

b. These changes are both hyperplastic and hypertrophic in character.

c. The hypertrophy is most common between the ages of four and twelve, disappearing in atrophic change between thirty and thirty-five years of age.

d. The lymphoidal action gradually retrogrades upon occlusion of the eliminating surfaces and ducts.

e. Systemic absorption may be augmented by the atrophic thinning of the epithelial lining and decreased leucocytosis may accompany abrasion of the surface.

i. Whatever of functional importance may have attached to enlarged tonsils during periods of special lymphoidal activity, in all probability does not exist when such period has ceased.

j. Statistics do not indicate any systemic deprivation either general or in special sense organs after indicated surgical interference properly indicated.

LIV.

ATROPHIC RHINITIS.

(RHINITIS ATROPHICANS SIMPLEX ET FOETIDA, SEU OZAENA.)

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EARLY HISTORY.

The relation between atrophic rhinitis and so-called ozena as well as their essential character has not up to the present been wholly elucidated.

The term ozena is found in medicine since the earliest times. Primarily, the name "ozena" was given to all pathologic processes of the nose associated with exhalation of a disagreeable odor. Later, however, it was limited to fetid ulceration of the nose (Pliny, Celsus). Galen distinguishes two kinds of ozena: (1) Simple ulcerations difficult to heal. (2) Those associated with a disagreeable odor.

Paulus Aegina regarded ozena as rotting and purulent ulceration, caused by saturation of the interior of the nose with sharp humors. This opinion, of which Aetzius and Trallianus were also adherents, was maintained until the twelfth century. Actuarius first proved that an ulcerative process is not necessarily present, and that the ozena is caused by a decomposition of the secretion, although some authors, Ambrose Paré, for instance, held to Galen's opinion.

This rational theory of Actuarius was further developed at the beginning of the seventeenth century by Joannes Crato, who regarded ozena as an infectious disease, which latterly has been proved by Capart.

So great, however, was the authority of Galen then that such authors as Fabricius, Aquapendente and Sir Thomas Mayern returned to the opinion that ozena consists in ulceration of the nose, often associated with syphilis.

At the end of the seventeenth century Vieussens, Reininger and Günz maintained that ozena is not an independent disease, but depends upon suppuration from the nasal sinuses, which opinion has been warmly advocated of late by Grünwald of Monaco.

RECENT HISTORY.

Weber in the second half of the nineteenth century (1860), regarding *ozena* as not an independent pathologic process but as a symptom, was of the opinion that the term *ozena* is superfluous. At present such authors as Castex, Grünwald, Krakauer, etc., are of like view. Solis-Cohen proposes "*coryza foetida*" instead of this term. Seifert dispenses with it also, distinguishing only "*rhinitis atrophicans simplex*" and "*rhinitis atrophicans foetida*"; and he regards both forms as varieties of *rhinitis chronica*.

Likewise, Krieg, author of the excellent monograph in Heymann's *Handbuch*, distinguishes "*rhinitis atrophicans crustans non-foetida*" and "*foetida seu ozaena*," regarding both pathologic processes as one. With this opinion, however, the French school does not agree, especially Tissier, Gougenheim, Baratoux and Charazac. Moure distinguishes five forms of *ozena*: adenoid, sinus, necrotic, purulent and atrophic. Finally Cozzolino proposes the term "*Keratosis degenerativa saprophytica*," and Sticker "*xerosis*," identifying it with *tabes*.

Since then and up to the present, confusion reigns both as to the term itself and the nature of the disease.

Upon no other disease in rhinology and laryngology, except perhaps diphtheria and tuberculosis, have so much time and paper been wasted as upon "*atrophic rhinitis*." It is enough to say that the papers touching this question, especially etiology and treatment, have reached an imposing number—about 500. Of these, the greater portion belong to America (105), Germany (98) and France (90). Other nations include England (35), Italy (23), Austria (14), Belgium (13), Spain (9), Switzerland (8), Holland (6), Russia (5), Denmark (5), Poland (4) and Sweden (1).

Of the best papers I must mention here, above all: In America, John Mackenzie's, of Baltimore (1884), Mulhall's, of St. Louis (1885), Wright's (1891), Wilson's (1892), Kyle's (1894—an excellent bacteriologic paper), Seiss's (1896), etc. In Germany, Höffler's (1885), Gerber's (1890), Grünwald's (1893), Hopmann's (1893), Abel's (1893—bacteriologic), Krieg's (1897—an excellent monograph), Cholewa's and Cordes (1898) and finally the very good monograph of Grosskopf (1902). In France, Loewenberg's (1884—bacteriologic, published at the same time in German), Lacoarret's (1888), Moure's (1888), Tissier's (1894), Lautmann's (1897).

In England, Williams's (1887), Haviland Hall's, etc. In Italy, Belfanti's and della Vedova's (1896—bacteriologic) and de Simoni's (1897). In Austria, Habermann's (1886) as well as Hajek's (1886). In Switzerland, Wyss's monograph (1886) and Siebenmann's (1900). In Poland, Baurowicz's (1895—bacteriologic).

DEFINITION OF ATROPHIC RHINITIS.

In accordance with the generally accepted opinion* (B. Fraenkel, Baginsky, Gottstein, Beverly Robinson, Krieg, Grosskopf) by the term atrophic rhinitis, which I shall divide into rhinitis atrophicans simplex and foetida, regarding them as one pathologic process (Krieg). I understand chronic catarrh of the nose, not having an ulcerative or destructive character, which may spread to the pharynx or larynx, and which differs from simple chronic catarrh by a more or less thick, quickly drying secretion, leading to the formation of crusts which are characterized by a very strong, disagreeable, specific odor (ozena), and by atrophy of the mucous membrane and bones of the nose.*

PATHOLOGIC ANATOMY.

Under the microscope the mucous membrane shows a chronic inflammation, hence masses of leucocytes with fatty detritus are seen; the epithelium is changed from cylindrical to squamous (one or many layers) with cornification of the superficial strata (Valentin, Suchardt, Seifert). The glands, acinous and tubular, are atrophied and with them the olfactory apparatus. Later the inflammatory cells are changed more and more into fibres of connective tissue, and then the mucous membrane becomes cicatrized, thin, hard and dry. Atrophy of the bones of the turbinates ensues; they become thin, friable, sometimes perforated, undergo changes in form; the inferior border of the turbinates—normally convex—becomes straight or even concave finally. The nasal septum as well as the bones of the face also undergo the atrophic process (Zuckerkindl). The accessory sinuses of the nose are often affected, the mucous membrane is dirty gray, bleeding and covered with dirty green mucus or mucopurulent secretion (Hartman, Krause, Zuckerkindl, Haberman).

[*Part of this paper relating to the Etiology of Atrophic Rhinitis was published in the Fraenkel Festschrift Number of The Annals, December, 1906.]

Microscopic examination of the secretion in cases of atrophic rhinitis was first performed in the year 1882 by E. Fraenkel, by means of Gottstein's tampons left in the nasal cavities from two to six hours. He found cells and microorganisms after two hours, more numerous after six hours.

According to Dobell this secretion is made up mostly of leucocytes, partly, however, of the so-called "mastzellen." It is generally found at certain constant points on the mucous membrane, the spots spreading out and over the adjacent tissue.

Nanek draws attention to the deficiency of rhodan in the secretion of ozena. (Normally it exists in the serous glands.) Muck confirms this.

SYMPTOMS.

FETOR.—The most important symptom, characteristic of ozena, is fetor, which constantly occurs in this disorder, and distinguishes it from simple chronic rhinitis. It is so characteristic that when once met with, it will never be forgotten. It is almost insupportable in removing the crusts. I remember, among others, the case of an 18-year-old girl, whom I was obliged to receive at special hours. Notwithstanding opening of the windows and disinfection of the rooms, the odor persisted for hours and was even perceptible for days.

The odor, which is difficult to describe, is something like that of herring spawn, decaying cheese, the perspiring feet of certain individuals. In general, it differs from any other odor; for instance, that in suppuration of the accessory sinuses, syphilis or foreign bodies. This fetor makes a profession or study intolerable; association with other persons may cause neurasthenia or even suicide. What is worse, however, the patients often do not smell it themselves, but associates do (*cacosmia objectiva*).

As I have mentioned, this symptom is constant in ozena. It may be more or less pronounced, can increase or diminish under special conditions. For instance, according to Jurasz, it is stronger in winter than in summer—in general, during dry weather as well as in dry climates (frost and heat in southern countries). In the humid seasons of the year patients with ozena feel relatively better, the fetor being less pronounced.

Generally speaking, it increases during certain physiologic states of women—especially during menstruation. Jurasz ob-

served diminution of the bad odor during pregnancy. There are also intermissions, so that for days or weeks there is no fetor. Jurasz calls the condition "ozaena periodica."

DIMINUTION AND LOSS OF SMELL (HYPOSMIA AND ANOSMIA).—To the symptoms disagreeable to patient belong diminution and loss of smell. This symptom, due to fatty degeneration of the olfactory epithelium, I noticed in my practice 440 times in 1142 cases of atrophic rhinitis; i. e., in over one-third, and anosmia in 180. Jurasz observed it 18 times in 170 cases.

The writer holds that even in the most advanced forms of ozena, smell may be intact, which is difficult to explain, but I have observed it. Once, even, I noticed hyperosmia in a very nervous, hysterical woman, suffering from typical ozena. I have also observed parosmia (*cacosmia subjectiva*) 10 times in my practice. Relatively, often simultaneously with diminution or lack of smell, there was diminution or absence of taste (*agensia et paragensia*; that is to say, in 20 cases of atrophic rhinitis).

OBSTRUCTION OF THE NOSE.—Obstruction of the nose with difficult breathing is caused by the presence of crusts on both sides, or unilateral in cases of deflection of the nasal septum, and then always on the concave side. It occurs more often with flat nose (Jurasz). Finally it may occur in cases of accompanying affection of the larynx (*laryngitis sicca*).

DRYNESS OF THE NOSE AND THROAT.—Dryness of the nose is a very disagreeable symptom in cases of atrophic rhinitis simplex as well as foetida, seu ozaena. It is dependent on the character of the secretion which tends to dry, so that patients, rather seldom employ handkerchiefs, but simply extract the crusts with their fingers, sometimes removing complete casts of the nasal cavities, which often produces bleeding.

In general, as Jurasz rightly remarks, these patients are characterized by a lack of predisposition to acute catarrhs, at which times they feel much better.

As infection of the nasopharynx and pharynx, and sometimes larynx and bronchi, exists simultaneously with atrophic rhinitis, there is added to the disagreeable dryness of the nose a sensation of dryness in the throat, which is especially annoying at night. In the morning actual vomiting may be caused by the effort to extract dried secretion from the nasopharyngeal cavity. There are also hoarseness and cough as well as dyspnea.

EPISTAXIS.—Relatively often (64 cases) I noted in my practice bleeding from the nose (epistaxis). Jurasz also mentions this symptom (6 in 170).

AURICULAR AND OCULAR DISTURBANCES.—In cases of complicating disease of the eyes and ears, as well as the accessory sinuses of the nose, there are rush (streptitus), diminished hearing, tearing (lachrymation), weakness of vision, supuration and supra- and infraorbital neuralgia.

HEADACHE.—Headache belongs to the frequent symptoms of atrophic rhinitis, not only in the event of complications, but also in a reflex way, in the form of pressure in the region of the forehead and temples, often actual migraine. In 1142 cases, I noticed this symptom in 220, almost 20 per cent. Jurasz met with it in 23 of 170, 13.5 per cent.

VERTIGO.—Vertigo I observed 10 times, of which 6 probably depended upon auricular processes.

APROSEXIA.—Aprosexia, a common symptom of adenoid vegetations (Guye), I observed in 70 cases of atrophic rhinitis, of which, however, 60 cases were complicated with adenoids.

ASTHMA.—Relatively often, i. e., 28 cases, I have found asthma with atrophic rhinitis; in 18 of these, however, there were hypertrophied turbinates. In the other 10 cases the asthma must be explained as a reflex due to irritation by crusts.

OTHER SYMPTOMS.—Nasal speech—20 cases, of which 15 had adenoids.

Enuresis nocturna—4 cases, all complicated with adenoids.

Paresthesia pharyngis—20.

Neuralgia linguæ—4.

Neuralgia trigemini—4 cases, one with a complicating chronic otorrhea.

Neurasthenia, especially in the form of cancro-syphilo- or phthisiophobia, relatively frequent, i. e., 48 cases. Probably a result rather than cause of atrophic rhinitis.

COMPLICATIONS.

The complications of atrophic rhinitis are, in general, frequent. Peck, author of a special contribution (Paris, 1889), found them in 21 per cent. According to this author they occur principally in the following organs: (1) Lachrymal passages and organs of sight. (2) Accessory cavities of the nose. (3) Ears and mastoid processes. (4) Larynx, trachea and bronchi. (5) Organs of digestion. (6) Nervous system.

ADENOIDS.—One of the most frequent complications of atrophic rhinitis is the condition known as adenoid vegetations. These I found in 64 of 1142 cases, more than 5 per cent.

According to Grünwald and Conetenu, adenoid vegetations predispose to ozena, so that they are of the opinion that there exists a causal relation between these two disorders. Grünwald saw recovery from ozena after operation for adenoids. Kayser, on the contrary, is of the opinion that ozena and adenoids mutually exclude each other, with which, however, Cholewa does not agree. Heymann, supplanting the view of Grünwald, goes still further; he maintains that their existence acts as a repressing influence upon the development of ozena, and advises artificially increasing their volume as a therapeutic measure, by brushing the nasopharyngeal cavity with powdered capsicum.

HYPERTROPHIED TURBINATES.—I have observed hypertrophy of the nasal turbinates quite often, 60 times in 1142 cases, over 5 per cent. The middle turbinates alone were affected in 28, the inferior turbinates alone in 22 and both in 10, usually the middle being affected on one side and the inferior on the other. Jurasz also noted these hypertrophies 8 times in 170, 4 being of the middle.

These statistics confirm the opinion of most authors that atrophic rhinitis is a result of the hypertrophic form (John Mackenzie, Gottstein, Schaeffer, Moure). Besides the clinical facts in favor of this view, there are histologic researches showing that under the microscope both the processes have been observed together (Flesh, Sieur, Jacob).

Adherents of the theory of the heredity of atrophic rhinitis (ozaena neonatorum), Schirmansky, for instance, regard this latter as proof to the contrary. John Mackenzie, however, rightly calls attention to the fact that even in such cases we cannot be sure there was no catarrh in utero.

Demme saw the transition of the hypertrophic into the atrophic form, which I also had occasion to see in some cases. Fisher, Williams and Gruber also found both forms simultaneously.

There are opponents of this opinion, such as Wyss, Heymann, Roth and Mulhall. The latter advances the following: (1) In most cases of hypertrophy there is no subsequent atrophy. (2) There are no cases in which, in one and

the same person, both forms have been established. (3) Atrophy always occurs in children and hypertrophy in adults. (4) Atrophy occurs oftener in females. Mohrmann, again, maintains (incorrectly, however) that we have no histologic proofs. Valentin and Kayser are of opinion that the disease is congenital (hereditary). Rethi thinks that both opinions are correct—that atrophic rhinitis may result from the hypertrophic or be independent.

HYPERTROPHY OF TONSILS, DEVIATION OF THE SEPTUM, ETC. I observed hypertrophy of the palatine tonsils in 60 cases, and hypertrophy of the lingual tonsils in 42, in 20 of which there existed simultaneously hypertrophy of all of Waldeyer's ring.

Deviation of the septum, ridges and spurs occurred in 48 of my cases, which may have some significance in the etiology of atrophic rhinitis, the concave, i. e., the wider, side being nearly always the one affected by the atrophic process.

Further, I noticed 16 cases with caseous tonsillitis; 10 cases with nasal polypi, 32 with disfiguration of the nose (*nez de mou-ton*, saddle-nose), 10 of which were syphilitic; 20 with perforation of the septum. Jurasz observed the latter in 10 of 170 cases. I had 4 cases with *ulcus rotundum v. perforans*, probably due to scraping off dried secretion with the fingers on the antero-inferior aspect of the septum; i. e., on the so-called "*locus Kiesselbachii*," or "*xerosis*" of Zuckerkandl—sites of nasal hemorrhage. *Bulla ossea* of the middle turbinate I observed in 2 cases, and *acne rosacea* in 2. *Eczema nasi* occurred frequently, 56 in 1142 cases; Jurasz noted it in 5 of 170.

OTHER PATHOLOGIC PROCESSES.—Of other pathologic processes I have noticed: *Corpus alienum nasi* 2 cases. *fibroma* or *angioma uvulae* 2 cases; *lingua nigra* 1 case (Wyss 2 cases); *tonsillitis leptothricia* 2 cases; *pharyngitis granulosa et lateralis s. retroarcuatis* 14.

As regards catarrh of the pharynx and nasopharynx (*rinitis posterior et pharyngitis chronica*), it occurred in nearly all my cases and was of the same character; i. e., an atrophic dry catarrh. Jurasz noted the same (55.3 per cent) as well as Siebenmann, Loewenburg and Guye (constant).

Disturbances of digestion (*gastritis dyspepsia*) were seen by Peck. He also noted anomalies of the nervous system. Desimani saw 2 cases of epilepsy cured after recovery from *ozena*.

LARYNGITIS ET TRACHEITIS SICCA.—According to Semon, affection of the larynx and trachea with the atrophic process (laryngitis et tracheitis sicca), at least in England, belongs to the rare complications. For the most part it is secondary; according to Fisher, it is always so. I have observed laryngitis sicca as a secondary complication in 44 of 1142 cases, in which tracheitis occurred in 4.

Some authors (Luc, Hunter, Mackenzie, Massei, Moure, Hope, Mendel, Baginsky, Zarniko, Hitt, Wagner, Chauveau, Hamilton, Grönbeck and G. de la Notte) observed primary laryngitis as well as tracheitis sicca, seu ozaena laryngotrachealis. Luc in such cases, three in number, found the diplococcus of Loewenberg in the secretion of the larynx and trachea. The characteristic symptom of such cases is fetor ex ore, the nasal cavities being quite healthy. I also had occasion to observe 4 such cases of primary laryngitis s. tracheitis sicca (ozaena laryngotrachealis). In 39 cases I noted simple chronic laryngitis and 4 acute.

Jurasz also met with this complication relatively often. Of 170 cases he found laryngitis sicca in 8, simple laryngitis in 8 and tracheitis sicca in 1.

In 87 cases there were bronchial symptoms (chronic inflammation). Paresis laryngis I noted in 24 cases. Jurasz reports 3 such. Hoarseness without changes in the larynx was observed by Seiss, Langrange, Gougenheim (over-extension of the cords) and Moure (disturbance of innervation of the expiratory muscles).

Chauveau saw hemoptysis, simulating that of a tubercular process in the lungs, in a case of ozena, which I also had occasion to observe in two cases.

Stenosis of the larynx (blennorrhea Stoerki) was seen in this disease by Suketowski and Herynz.

AURAL COMPLICATIONS.—I have seen ear complications exceedingly often, 166 of 1142 cases; i. e., more than 14.5 per cent. Zaufal was first to draw attention to this fact. Wyss in 60 cases noticed this complication 47 times. Likewise, Williams, Noquet, Berthold and Peck. Only one, Loewenberg, is of contrary opinion; i. e., that aural disturbance is rare in this disorder.

In the pus of cases of chronic otorrhea accompanying atrophic rhinitis, Maclay and Viollet found the bacillus mucosus of Loewenberg-Abel. Ferrari, who occupied himself espe-

cially with this question, found them in 44 of 430 cases.

Of my 166 cases of ear disease the greater part, 74, were chronic purulent otitis; the remaining cases include simple middle ear catarrh (22), of the Eustachian tubes (20), acute suppuration of the middle ear (6), acute catarrh of the middle ear (4), cholesteatoma (3), caries of the mastoid process (6), lues (5), tuberculosis (4). Quite often I met with cerumen, finding it in 20 cases. There were 2 cases of deaf-mutism.

Jurasz noted aural complications in 12 of 170 cases of ozena.

OCULAR DISTURBANCES.—These are also relatively frequent in atrophic rhinitis. I noticed them in 80 cases, over 7.5 per cent. Jurasz had 4 in 170.

In my cases the nasolachrymal canal was particularly affected, simply by continuity, resulting in dacryocystitis with tearing 30 cases, and blenorrhoea of the lachrymal sac 20 cases. There were 10 cases of blepharoconjunctivitis, 8 of conjunctivitis and 2 of scrofulous keratoconjunctivitis. Of the rarer pathologic processes I noticed empyema palpebrarum 1, cataract 2, nystagmus 1 and muscae volantes 6.

Williams often observed affection of the lachrymal ducts in this disorder. Gruber in 30 cases of dacryocystitis noticed ozena in 19 and atrophic rhinitis in 8. Ulcer of the cornea was seen by Trousseau and by Bick, optic neuritis by Sulzer. Peck saw dacryocystitis, conjunctivitis, ulcer of the cornea and optic neuritis.

ACCESSORY NASAL CAVITIES.—The accessory cavities of the nose are often affected, mostly as empyemata. In my cases I observed this complication 86 times, about 8 per cent. All of these cases were proved by transillumination as well as by other methods of examination.

Of these cases 20 were suppuration of the antrum of Highmore, 12 both, 14 the right and 16 the left. The frontal sinus was affected in 9 (in 4 cases both, in 3 the left). In 6 cases there was empyema of the frontal and maxillary sinuses. The ethmoid cells were affected in 20 cases (caries and empyema) in combination with empyema of Highmore's antrum 4. There were 4 cases involving the sphenoidal sinus, and in 1 case the maxillary, frontal, sphenoidal and ethmoidal were all involved.

What is the connection between ozena and empyema of

the accessory sinuses? Is the theory of Grünwald, that ozena is of sinus origin, correct?

This question has already been solved negatively by the writer. Although both these diseases often occur simultaneously, as shown by my statistics above, the causal connection, in Grünwald's meaning, has not been proved. For instance, in my observation of 290 cases of atrophic rhinitis in which transillumination was used, I could not find any changes in the nasal accessory cavities. I have also remarked that the majority of authors think Grünwald's theory is incorrect. According to Luc, empyema of the maxillary antrum often simulates ozena.

CLINICAL PICTURE OF ATROPHIC RHINITIS.

Above all *ex aspectu*, the general appearance of the face is striking in this disease. It is pale, swollen. The nose and lips, especially the upper, are also swollen. In a word, the symptoms are those of scrofulous patients.

Usually these patients exhibit a bad general state (Loewenberg), though not always. Very often we meet with quite healthy looking persons.

The external form of the nose frequently shows more or less pronounced change (Krieg). The nose is more or less diminished in volume and tilted. The nostrils are vertical, or, what is more frequent, the nose is thick, flat at the base, more or less concave, often the typical sheep nose (32 cases in my practice). Retracted *alae nasi* have been observed (Stewart).

Generally the changes of external appearance of the nose are frequent in atrophic rhinitis, especially the fetid form, ozena (Patiquet, Valentin). Some authors are of contrary opinion (Noquet, Cozzolino). Even, Voltolini, for instance, maintains that he has never seen any change in the external configuration of the nose.

ANTERIOR RHINOSCOPY.—Upon anterior rhinoscopic examination we see the nasal cavities filled with more or less dry secretion (crusts) seemingly covered with meal-dust, dirty, green, sometimes blackish, tenaciously adhering to the anterior end of the middle turbinate, or, more rarely, the inferior turbinate, the nasal septum and posterior part of the nasal cavity.

Sometimes these crusts hang inside the nose like stalactites. There is also more or less fluid secretion, grayish mucus or yellow purulent.

After removing these crusts by careful (!) irrigation of the nose, or by using the forceps, the nasal cavities appear wide, one on the concave side of the septum, generally wider than the other.

On minute examination it is evident that this increase of volume of the nasal cavities is caused by a more or less pronounced atrophy of the turbinates, especially the inferior and partly the middle. The turbinates appear as mere ledges or prominences.

Sometimes the middle turbinates adhere to the nasal septum, in case it is deflected, or when their anterior ends are hypertrophied, which, as I mentioned, happens pretty often.

This condition of the cavities permits seeing by anterior rhinoscopy details which are normally impossible to see, as, for instance, the entire hiatus semilunaris with the openings of Highmore's antrum and the frontal sinuses, as well as the posterior wall of the nasopharynx with its so-called Passavant's prominence, the lateral walls with the openings of the Eustachian tubes, the ostia of the sphenoid sinus, the vault of the pharynx with more or less of Luschka's tonsil and the movements of the velum palati in speaking and swallowing.

Atrophy of the turbinates may be unilateral (Jurasz 3 cases, myself 20 cases—12 on the left and 8 on the right side, usually in the wider cavity). Such cases of unilateral atrophy were observed also by Strübing, Semon, Siebenmann, Smit (also cases with deflected septa), and Schmiegelow. Jurasz made special observations as to the state of the turbinates in 180 cases of atrophic rhinitis. He noted atrophy of both inferior turbinates 5 times at the anterior ends and 4 times at the posterior; in 2 cases both the inferior and middle turbinates were atrophied.

In 1142 cases of atrophic rhinitis simple and fetid, I noticed atrophy of both turbinated bodies 380 times, about one-third of all. The atrophic process was especially marked at the anterior ends of the turbinates. On the middle turbinates I noticed it only 24 times, and 15 times in both inferior and middle.

As above mentioned, I observed hypertrophy of the middle turbinates rather often—60 cases. In the remaining cases the turbinates were practically normal, at least without pronounced changes.

In 35 cases there were combinations of the hypertrophic

and atrophic processes—in one-half the nose atrophy of the turbinated bodies (20 cases) or middle turbinates (15); in the other, hypertrophy mainly of the middle, and more rarely of the inferior, turbinates.

The mucous membrane may also be more or less atrophied, and here, again, there may be hypertrophic spots as well as atrophic ones. Accordingly, the mucous membrane appears glistening, pale, parchment-like; elsewhere, however, red, soft and bleeding slightly when touched.

COURSE.

The course of atrophic rhinitis, simple or fetid, is generally very slow—it is chronic *par excellence*. The disease lasts many years (40—Semon). As I have said, there are ameliorations and deteriorations, even intervals of a relatively healthy condition (Jurasz).

I have observed one case, that of a young unmarried woman, in which the very obstinate *ozena* disappeared after marriage, although the contrary may occur.

DIAGNOSIS.

The diagnosis of atrophic rhinitis is in general not difficult, in its fetid form, *ozena*. In the latter one symptom is sufficient to establish the diagnosis of *ozena*, namely, the fetor which is so characteristic that it is hard to make a mistake.

Although there is fetor also in other purulent pathologic processes in the nose, for instance, empyema of the accessory cavities, foreign bodies, syphilis, etc., nevertheless, as I have mentioned, this fetor is quite different from that of *ozena*.

In view of the parasitic origin of atrophic rhinitis, a bacteriologic examination showing Loewenberg-Abel's bacillus mucosus may also confirm the diagnosis; likewise a microscopic histologic examination showing cornification of epithelium, the so-called metaplasia (Siebenmann). This latter method (excision of the middle turbinates and examination under the microscope, is advised by Sporleder as well as by Grosskopf.

Chemical examination of the secretion in *ozena* may assist by revealing a deficiency of rhodan (Muck).

Sometimes it is rather difficult to differentiate atrophic rhinitis from similar pathologic processes, such as so-called

rhinitis sicca anterior (Ribon and Siebenmann), xanthosis (Zuckerkandl) and the blenorrhea of Stoerk.

It is easier to distinguish this disease from rhinoscleroma, especially as the bacillus of Frisch appears to be identical with Loewenberg-Abel's bacillus mucosus.

PROGNOSIS.

The prognosis of atrophic rhinitis, either simple, or, particularly, the fetid form, is favorable only *quoad vitam*. it is bad, however, *quo ad valetudinem completam*, recovery from this disease being exceedingly rare.

Most authors are of opinion that atrophic rhinitis, especially ozena, is incurable (Mulhall, Lefferts, Gelle and Blendian, Wagner, Flatow, Krakauer, Watermann, Haviland Hall, Cholewa and Cordes). On the other hand, many writers are not so skeptical as to recovery. Of these, should be mentioned first of all the French school with Moure at its head (Noquet, Garrigue, Dessalines, Baratoux, Chazazac, Lacoarret); the Belgians (Cheval, Delie, Capart, Rousseau). In America, as well as in Germany, this view has fewer adherents (Wright, Dunn, North, Hamilton, Laker, Bram, Jurasz, Rethi and Grosskopf). In Italy, Massei, Belfanti and della Vedova—authors of "diphtheritic origin of ozena." In Russia, Schirmanski, etc.

The following authors in particular state that spontaneous recovery from ozena is possible: (Rethi, Kuttner Jurasz, Burger and Kayser), that in later life the principal symptom, fetor, diminishes and even disappears entirely (after 50—M. Mackenzie). Wright and Hugues go still further, maintaining that spontaneous recovery occurs at every age.

According to Dunn, even complete regeneration of the atrophied mucous membrane is possible—a very audacious opinion, to say the least.

All of these authors agree, however, that recovery is only possible with an abundance of patience on the part of both physician and patient during the treatment. The latter is necessarily long, lasting not weeks but months and even years (Moure, Jurasz, Wright, Grosskopf). In my opinion recovery from atrophic rhinitis is possible, but, at most, it can only be relative, i. e., disappearance of the

chief symptoms, fetor and secretion, sometimes the regaining of smell.

However, as to regeneration of atrophic mucous membrane and nasal bones, I do not believe in it.

TREATMENT.

GENERAL.—Treatment must be two-fold—local and general. This latter, in my opinion, is very important, and in every case where the general state of health is defective must be applied.

The relatively favorable results from my treatment of this disease I must ascribe to the simultaneous use of both measures, general and local, especially as the general is causal (constitutional origin of atrophic rhinitis). Kyle, Schestakow, Grosskopf and Mazazuto are, among others, of the same opinion.

It is very important to apply from childhood prophylactic remedies—general treatment. There is no doubt that in this manner we could avoid the appearance of this pathologic process at a later age.

So, for instance, beginning at the earliest age there must be the best and most reasonable hygiene, including suitable nutrition, gymnastics, sports, fresh air, avoidance of excessive mental work, etc.

As very suitable for children I regard the use of oleum jecoris aselli as well as preparations of iodine (iodide of iron by itself, or, still better, with equal parts of oleum jecoris aselli, pilulae Blancart, etc.). Iodic salt baths (Hall, Creuznach, Ciechajnek, Loomis) as well as sulphur baths (Treverden, Busk, Schinznach, Baden) may be used, especially in scrofulous cases.

At the same time the local manifestations of this constitutional predisposition, such as adenoids, hypertrophied tonsils, must also be treated—naturally in a surgical way.

If the atrophic process already exists the general treatment is also indicated, particularly iodine salts and sulphur baths.

Sea baths are warmly recommended by Friedrich. This writer holds that the humid sea climate has a favorable influence upon the dryness as well as crust formation in the nose.

Thomas R. French advises simply fresh air and cold baths, which are especially indicated for neurasthenic patients.

In cases of anemia or chlorosis in young girls good effect

is had from the iron baths of Francenbad, Krynica, Elater, St. Moritz and in cases of obesity, Marienbad. For nervous patients mountain air (Switzerland, Zakopan) must be advised.

Of drugs, besides the before-mentioned iodine and iron, there are also used with more or less success arsenic, iodine and phosphorus (Kyle) and Heyden's creosotal (Mazazotto)—24 to 30 drops in syrup or oleum jecoris aselli, t. i. d.

LOCAL TREATMENT.—I pass now to the drugs and methods locally applied in atrophic rhinitis, the number of which is legion. The methods employed in this disorder ranging from the oldest, irrigation of the nasal cavities, to the newest, subcutaneous injection of serum, all have their adherents and opponents.

IRRIGATION.—Irrigation by means of Weber's douche or the double English syringe is the oldest and until now most common therapeutic method of treating ozena. It is dangerous, however, when not correctly used on account of the possibility of infecting the ears, especially because to cleanse the nasal cavities of crusts it is necessary to employ, (1) considerable force and (2) great quantities of fluid (20 to 50 litres!—Range). In order to avoid these bad consequences (Michel, Grosskopf, etc.) we must remember three things: (1) The syringe must be held horizontally, i. e., in the direction of the inferior meatus, (2) always to irrigate on the narrower side (convexity of the septum) and (3) not to employ too strong a current.

Greville McDonald and also Hamilton advise a lying position with the head dependent.

At Schwartze's clinic in Halle the irrigation is done from behind through the nasopharynx. This is also advised by Moure, of Bordeaux, and Jurasz, of Heidelberg, with a special curved syringe having several openings at the tip.

On the other hand, it is exceedingly important to keep the nasal cavities clean, this being the basic principle in treating atrophic rhinitis (Klemperer).

NASAL BATHS.—This aim can be reached by other methods, as, for instance, the so-called nasal baths (M. Schmidt) which consist in pouring fluids into the nose by means of a teaspoon or Fraenkel's special apparatus, in order to avoid the entrance of the liquor into the pharynx or larynx.

The temperature of the fluid, which must be tepid, is of importance. Kiesselbach advises commencing with a temperature of 10 degrees R. and going up to 14 degrees R.

SPRAYS.—The application of drugs in the form of sprays by means of Hartmann's or Schnitzler's sprays, either in front or behind, is generally insufficient for thorough cleansing, although the plan has its advocates (Grosskopf, Musehold, Meyjes).

TAMPONS.—Still better are tampons, saturated with various remedies, introduced into the nasal cavities and left there for a time.

This method was employed for the first time in 1878 by Gottstein, and has been much used since then. Among others, Krieg is an ardent supporter of this plan, which he regards as the best. So also are Aysaguer, Krakauer, Seiler, Bara-toux, Hamilton and Hagedorn.

The method consists in the introduction of tampons, 3-5 cm. long, by means of special sounds (Gottstein, Grosskopf) or without using the latter (Krieg, Seifert).

The tampon remains in the nose 24 hours (Gottstein) or 4 hours (Krieg) or only a half or quarter hour (Zarniko).

A modification of Gottstein's tamponnade is Bruck's, the so-called permanent one. The tampon can be wet with different remedies.

BRUSHING.—Brushing with various solutions is sometimes employed, without being efficacious, however.

MASSAGE.—Still better is vibratory massage of the nasal mucous membrane. This method was first introduced into the therapy of diseases in the upper respiratory tract in 1890 by Braun, of Trieste, and later by Laker, of Graz. Since then it has found many supporters—Garnault, Felici, Sendziak, Denme, Jankau, Dionisio, Kirchner, Krakauer, Abeille, Pleuric, Lucae, Brenner, Sterch, Watermann, Moure, Grad-enigo, Daae, Blondian, Berthold, Seiss, Burger, Boris, Brindel, Spiess and M. Schmidt. Most of them employ for massage special sounds with a wad rolled on the tip (Braun, Laker). Others advise apparatus—Daae, Löhnberg, Breitung, foot-motor; M. Schmidt, electric motor; Dionisio and Jankau compressed air.

The most conspicuous opponents of the method are Chiari and Kuttner.

As for myself, like Braun, Laker, Garnault, I, too, regard vibratory massage as the best treatment of atrophic rhinitis, effleurage and vibrations being able to stimulate the atrophied mucous membrane to renewed life. In the main with the

above method I had the best results, even relative recovery frequently, in this obstinate disease.

INSUFFLATIONS.—As to insufflation of different powders, I regard this method, like Schech and Grosskopf, as not only useless, but even harmful, since it increases the disagreeable dryness of the nose.

INHALATIONS.—Although insufflation has its adherents (Bresgen, Rosenthal, Killian, Stetter, Hemm), a more rational method, especially where there is a complicating affection of the larynx, is the inhalation by means of Siegel's apparatus. This method is recommended by Kafemann, Kuttner and Dagail.

THE DIFFERENT THERAPEUTIC AGENTS.—By the above methods have been used thousands of remedies, of which the greater part have no value, and can be discarded without loss. Of these remedies I shall enumerate the most important.

RESOLVENTS.

1. Sterilized water (Barth).
2. Hot air (Kuttner, Dagail).
3. Sodium chlorid, a tablespoonful in a litre of water (Schwartz, Grosskopf, Mulhall, Valentin).
4. Mineral waters. Iodin salts, such as Reichenholl (Grosskopf), Wiesbaden, Ems (Ciechaeinek); sulphur (Cantoret-Lagrange); thermal (Compaired).
5. Potassium chlorate (Brügelmann, Moure, Baette, Nooves—the last using it as a spray 1-80).
6. Sodium bicarbonate (Mulhall, Moure, Kuttner). (Kuttner uses it by inhalation.)

ANTISEPTICS.

7. Boric acid; 10 to 30.0 in a litre of water, or alone (Mader).
8. Sodium biborate 20.0 in glycerin 70.0 and water 30.0 as a spray (*N. Y. Medical Record*); together with carbolic acid, salicylic acid and potassium hyp. (Lefferts).
9. Sublimite; 1 to 10000 (Schondorff, Loewenberg, Fackeldey); together with boric acid (Loewenberg).
10. Potassium permanganate; teaspoonful of 10 per cent solution in 1 litre of water (Kirchner, Schwartz).
11. Lysol (Stetter).
12. Thymol; 0.03 to 0.09 in alcohol and glycerin aa 2.0 and aqua dest. ad 30.0 as a spray; 0.3 to 0.6 in alcohol and glycerin aa 15.0 for mopping (Wright, Ledermann). 0.1 gly-

cerin and spirits aa 6.0, aqua dest. 30 (Siefert), or 20 per cent glycothymol (Cullen). Thymol, salol, salicylic and boric acid (Sieffert).

13. Thymic acid 5.0 (0.2), acid salicylic 15.0 (0.5), acid boric 5.0 (3.0), salol 15.0 (5.0), talcum powder 25.0 (8.0), for insufflation (Ed. *Phila. Medical Journal*. Tissier).

14. Ichthyol (Ertler-Phillips). 5 per cent in creolin for brushing; 2 to 5 per cent as spray; 25 per cent for brushing (Knight); in petroleum 50 per cent, ammonium sulpho-ichthyolate, 40 to 60 per cent (Strübing).

15. Creolin (Plesskopf), tampons; creolin-vasogen (Strübing).

16. Naphtol (Rualt) 12.0, alcohol (90 per cent) 84.0, also camphorated naphtol with vaselin.

17. Menthol—Bommier.

18. Europhen—Loewenstein, Ledermann.

19. Aristol (Loewenstein), dry; with collodion (Fasano, Sieffert, Braislin, Heymann).

20. Iodol—dry and on gauze, Flatau, Tissier; as snuff, KI with tannic acid and sodium baborate, equal parts, Turban.

21. Soziodol—Sieffert, Bresgen.

22. Iodin preparations—Baratoux; NaI by insufflation, Wolff; iodine and potassium iodide, Schroetter.

23. Cresol iodide—Peterson, Seifert; metacresolanytol, 1 per cent, Strübing; tricresoliodine, Ewing.

24. Resorcin—Tissier, John North; with cocaine, 10 per cent, Leland.

25. Aluminum aceto-tartrate—10 per cent, Bartholow; dry, Schaeffer, also in 50 per cent solution; a teaspoonful in a half to one liter; or 20 per cent, 10 drops in a glass, Krakauer. This remedy also gave me satisfaction.

26. Balsam of Peru—in equal parts with glycerin, Cohn, Seifert, Ebstein, Rosenbach. Upon tampons I often found it efficacious.

27. Glycerin—Roe; with vaselin, Seefers.

28. Oleum terebinthinae—on tampons, Malacrido.

29. Eucalyptus—Brown, 20 or 30 drops in an ounce of vaselin or lanolin.

30. Formaldehyde—Geo. L. Richards, 5 to 10 drops of 40 per cent in a glass; Knight.

31. Petroleum—petroli depurati 40.0, strychnin nitrate 0.02, ol. eucalyptus odor citrici 0.50, Bobone.

32. Hydrogen peroxid—Hope, Flatau, Watermann, Kyle, Seiss, Rosenthal.
33. Methylene blue—1 to 10 sodium sozoiodolate, Bresgen; 25 to 1000 Bennett; Moir.
34. Phenol sulphoricinate—30 per cent, Grosskopf; phenol sodium sulphoricinate, Dreyfuss.
35. Fl. ext. hydrastis—Bartholow.
36. Saponin—12 per cent, Valentin.
37. Zinc stearate—25 per cent, Gibb.
38. Listerine, an American antiseptic—1 to 10, Hall.
39. Acetanilid—Hubbard.
40. Creosote—5, alcohol 10, glycerin 40, Ferreri; 1 to 4 of glycerin, Desimeoni.
41. Citric acid—Flamur, Somers (75 per cent); Zaalberg, as powder with sacch. lactis.
42. Orthochlorphenol—10 per cent, Nichols.
43. Antozone—1 per cent, Brown.
44. Ozone—Rice.
45. Mustard oil—Kyle, 1 to 500.
46. Atrophin sulphate—Noquet, Baratoux.
47. Silver nitrate—Seiler, in powder; Estien, Mayes, 2 to 25 per cent in spray.
48. Zinc chlorid—1 to 10 per cent, Estein; zinc stearate, Leyler, Bresgen.
49. Trichloracetic acid—Bronner, Stein, $\frac{1}{2}$ to 10 per cent in ozena, $\frac{1}{2}$ to 1 per cent in atrophic rhinitis; 20 per cent, North, Rethi.
50. Chromic acid—Rethi.
51. Carbolic acid—Jurasz on tampons.
52. Calomel—with starch, 12 to 15.
53. Nosophen—M. Schmidt.

Sometimes several agents are included in one formula, as:

Acid carbolic	1.3
Aristol	2.6
Ol. ricini
Ol. cubeb	aa 4.0
Camphor	
Menthol	aa 2.0
Thymol	
Ol. eucalyp	aa 6.0
Albolene.....	q. s. ad 128.0

M. Sig. spray.

Wenzel.

Of the latest remedies and methods I must enumerate:

1. Intramuscular injections of iodine (1-3 aq.), Gradeingo.
2. Interstitial injections of vaselin (60 per cent) into the inferior turbinate, Brindel.

Injection of paraffin, Brindel, Compaired, Lake, Baratoux, Brockaert, Siess. This method is similar to that employed by Gersuny and others for "saddle nose," where it must be used with care. Brindel noted two cases of phlebitis. Flatau and Delic are opposed to this method.

SERUM TREATMENT.—In 1900, the Italian authors Belfanti and della Vedova, after bacteriologic investigations which showed the presence of pseudo-diphtheria bacilli in cases of ozena, suggested the use of antidiphtheritic serum. In 32 cases they had 16 recoveries, 7 were greatly improved, 4 were respited and 5 slightly improved. The opponents of this method are Ambrosini, Lombard, Avalan, Catherina, Samurta, Habermann, Kayser. Mediocre results were obtained by Grad-enigo, Massei, Masini, Longhini, Grazi, Farci, Ostino, Borio. Garnault in one case after injection observed acute articular rheumatism. Torres used normal horse serum with small success.

Generally speaking, the method found adherents only in Italy and while it was novel; very few in other countries (Compaired, Mouret, Cathelin, Lautmann, Molinie, Cozzolino, Nowtalo, Ablow and, to some extent, Frankenberger).

ELECTRICITY.—Electricity is rarely applied in the treatment of atrophic rhinitis and ozena. Faradization has its advocates in Garrison, Ralph W. Seiss and Delavan. Hartmann used galvanic electricity.

GALVANOCAUTERY.—The galvanocautery is rarely used in this disease (Noquet, Abeille, Retzi). Garrigueu, Desarienes, Mercié and Aysaguer regard the method as too painful.

ELECTROLYSIS.—Electrolysis has often found application, having advocates and opponents. The method was first used by Desarienes in 1884, afterward by Bryson Delavan and Kafemann. It has its warmest adherents in Belgium in Cheval, Bager, Joulsin, Capart and Rousseaux. Cheval, for instance, claims that he obtained by this method, which he calls "interstitial cupric electrolysis," 91 per cent of recoveries. The needles are introduced into the middle and inferior turbinates, the positive pole being copper, the negative steel. The action is bactericidal. According to Cobb, the materials of which the poles are made have no significance.

Other supporters of the method are de Roaldes, Hugues, Thomas (who advises a weak current, more than 15 milliamperes often being painful), Rethi, M. Schmidt, Moll, Dagail, Braat, Bride, Scholl, Bouronvillee, Marsip, Yonge and Massini.

As opponents, however, of this method, who are numerous, I must number the following: Goris and Delsaux, Schiffers, Hudelsohn, Schech, Haindl, Eckstein, Hajek, Chiari, Hennebert, Anehe and Brindel, Magnon, Moure, Zaalberg, Burger, Frederiks and Grosskopf.

I, also, am not a partisan of electrolysis in the treatment of this disease.

SURGICAL TREATMENT.—The surgical treatment of atrophic rhinitis and ozena finds few supporters. Cholewa advises fracturing the bones of turbinates. Cordes incises the turbinates. Tackeldey and Berliner extirpate the anterior hypertrophied end of the middle turbinate. Mackenzie advises curettement of the nasal cavities, and Guye of the nasopharynx.

MECHANICAL TREATMENT.—Saenger narrowed the nasal orifices with his nasal obturator. Kafeman's obturator also serves as an inhaler. Barth, for this purpose, used the hygroscopic wad, and Magdelung two pigeon feathers. Flatau employed pieces of ivory, and Claverdat, as well as Fodenat, caoutchouc tubes.

I must mention a curious fact: the favorable influence of erysipelas upon ozena—2 cases of Francesco, 1 of Somers and 1 of Levi.

Here, too, belongs a strange case reported by Spencer Watson: recovery from ozena after gonorrheal infection.

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LV.

A REPORT OF A CASE OF FIBROMYXOMA, INVOLVING THE LEFT SUPERIOR MAXILLA, INCLUDING THE ALVEOLUS, FLOOR, ANTERIOR AND POSTERIOR WALLS, AND OF SEVEN YEARS' DURATION.

By W. H. HASKIN, M. D.,

NEW YORK.

The knowledge of the life history of this peculiar form of growth appears to be very limited, and after considerable research I was unable to find any literature to assist me in the care of this patient. It seems to me that the duration and the persistent recurrence after repeated attempts at removal with curette and cautery, and the fact that it could not be classified as an encapsulated tumor, for it ramified in all directions and completely absorbed the bone in many places, point to a much more serious condition than is generally accepted for a fibroma. At the time of my operation there was decidedly more myxoma present than fibroma, and judging from the history given by the patient I believe that has always been the case. The freedom from pain, the absence of any tendency to suppurate (the surface always healing over after previous operations), and the lack of any lymphatic involvement contraindicate malignancy; but notwithstanding these facts, the ramifying nature, the recurrence and the gradual loss of weight of the patient seem to indicate a serious condition the true nature of which we have not yet grasped; and it is with the hope of learning more of its nature that I present this, to me, most interesting case.

The patient, Miss H. M. H., was brought to my office on February 2nd, 1907, by Dr. A. F. Bauer, a former student of mine at the dental college, with the following history: Family history excellent, both parents and two brothers being alive and in good health. Several years ago she suffered with menorrhagia and was cured by curettement. With that exception her history was good, and she had never been ill to her knowledge.

The following letter is the patient's own description of her case: "About the fall of 1900, while having some dental work done by Dr. F., of New York, I called his attention to a wisdom tooth that was troubling me. He lanced it, and later, I believe, he lanced it a second time. In February, 1901, I consulted a dental surgeon of Brooklyn in regard to having a tooth straightened. He at once noticed a small enlargement over or near the wisdom tooth, and called my attention to it, saying it ought to be attended to. I believe he then removed the tooth. Upon my return home I saw our family physician of Newark, in whose hands we placed the matter for treatment. In February, 1901, he sent some of the growth to the Board of Health of Newark, N. J. They pronounced it to be not malignant. The physician continued his treatment of it, cutting out at times considerable masses of it, hoping thus to check or destroy the growth. For a time it did not seem to be enlarging and it caused no discomfort, so little attention was paid to it. But in April, 1904, it became worse and was again treated when it was necessary to remove another tooth. From that date until February, 1907, it was not treated. March 22nd, 1907."

For two years nothing had been done, and as there was no pain the patient did not realize the serious nature of the condition until she consulted her dentist again, who immediately advised her to see a surgeon and referred her to me. For some months she had been unable to masticate on the left side, and occasionally had some dull aching on that side, but otherwise was not inconvenienced. She had at times noticed some puffiness under the left eye, but close questioning did not elicit any history of nasal discharge at any time. There had been a slowly developing mass appearing under the malar bone, but not until recently had it caused the left side of the face to appear fuller than the right. As said before, there was no actual pain, but at times there had been some dull aching on that side. From without the tumor felt hard and unyielding. Examination of the mouth revealed a great thickening of the alveolus from which the last two molar teeth had been extracted. The thickening extended forward to the canine tooth and inwardly over the palate process to within one-half an inch of the median line. Externally it bulged out forming a tumor the size of half an English walnut, with a hard bone-like wall, which extended upwards to and

apparently involved the malar process itself. Along the free border of the alveolus the mass felt soft and fluctuating and appeared somewhat translucent. The first molar and the second bicuspid were very loose in their sockets owing to the absorption of the alveolar bone tissues. An X-ray photograph shows this absorption very plainly. The nose was found to be in perfect condition and also the throat. Transillumination was negative, both antra showing light. On February 11th, 1907, under cocain and adrenalin anesthesia administered hypodermically, I made an incision along the free border of the alveolus, expecting to find a cyst. I found the fluctuation was due to the presence of a large amount of a semi-solid gelatinous mass, grayish pink in color, and I removed some of this for microscopic examination. The molar was then extracted and a probe was readily passed into the antrum through a root, it being found full of a soft growth. There was very little hemorrhage. The wound was packed with iodoform gauze, and the patient returned to her room to await the report of the pathologist. This was received on the 14th, and was as follows: Fibrous and epithelial hyperplasia in one piece of tissue submitted. In another piece, there is a matrix of homogeneous groundwork taking hemotoxylin stain, and in it are a number of finely wandering embryonic connective tissue cells. Diagnosis: Fibromyxoma.

DR. J. WRIGHT, Pathologist.

On the strength of this report I advised complete removal, and on February 26th this was done at the Manhattan Hospital, with the assistance of Drs. H. Smith and G. H. Ward. The operation was performed through the mouth, the floor, anterior wall and most of the posterior being removed in reaching the limit of the growth. It extended into the apex of the antrum, but in this region it was not attached, seeming to shell out rather easily, and the roof and inner wall of the antrum did not appear to be involved in the growth. Having dissected the periosteum from both the anterior wall and the palate process, these were removed together with the entire alveolar process up to the lateral incisor. The greater part of the palate bone was removed, exposing the muscles and opening the zygomatic and even the pterygoid-maxillary fossae, the delicate fatty tissue protruding into the wound in these regions. Having avoided the tuberosity and the posterior wall until the last, on account of the palatine arteries,

there was but little hemorrhage, the growth itself being singularly non-vascular. The involved bone was very soft, as though absorbed, and was easily removed with curettes. The growth also seemed to shell out in large masses, especially where the myxomatous tissue predominated. The greatest difficulty was found at the tuberosity and along the posterior wall, but this was overcome by using a large, powerful, round fenestrated tonsil punch, of German make, which cut through the softened osseous tissue with ease. In all, I should say, the growth weighed between two and three ounces, though possibly more. No opening was made into the nose or the orbital cavity, and fortunately the soft palate was not involved, so that there was no opening in that region. The cavity was packed with iodoform gauze, no attempt being made to introduce sutures. Dr. Wright reported again that the growth was fibromyxoma, with no evidence of sarcoma.

Subsequent history uneventful. Three months after operation the extensive cavity had entirely closed with apparently healthy tissue. The patient had gained in weight, and was being fitted with an endenture.

The literature on growths of this nature is exceedingly scant, as said before, being merely mentioned in the classification of tumors in most text books. The American Encyclopedia of Medicine says about them: "Fibromyxoma usually occurs in the region of the alveolus. When arising from the alveolus adjacent to the antrum it may project into that cavity and appear to be growing from it. These fibromata are considered by Bland Sutton to be of the same origin as odontomata. Some people consider that they may result from chronic inflammation around the apex of a tooth. Garrettson, Marshall and Grant, in their books on the surgical diseases of the jaws—books that are used as text books in the dental colleges—make no mention of these growths. Dr. Wright has written extensively on nasal growths which have been generally regarded as of this nature. Posey and Wright do not mention it. Kyle mentions it as appearing in the nose.

The most extensive description that I could find, however, is in *The American Practice of Surgery*, by Drs. Bryant and Buck:—"Myxomata are tumors of the mucoid character. Structurally they are composed of cells floating in a homogeneous, semi-fluid mucinous matrix. These cells are mononuclear, bipolar or stellate, and provided with more or less

elongated protoplasmic processes which interlace freely. The intercellular substance varies in amount in different tumors and in different parts of the same tumor. When abundant, it gives a characteristic gelatinous, semi-fluid, somewhat translucent appearance to the growth. Myxomata are grayish, or pinkish gray in color, owing to the presence of blood vessels that are more or less distinctly visible in the substance. On section, a jelly-like or ropy substance—mucin—exudes, which is not soluble in water, and gives a whitish precipitate with alcohol or dilute acetic acid.

Myxomata are rarely pure in type, but are usually combined with other tissues of a homologous nature. Mucoid tissue is closely related to fibrous tissue. The truth of this is evident when we remember that in the fetus the fatty tissues and fibrous tissues are first blocked out in mucoid material. Consequently, myxomata are commonly met with in the same regions from which fibromata and lipomata also spring. Further, mucoid tissue occurs in the adult body only in the vitreous humor of the eye, from which structure myxomata never develop.

Myxomata, therefore, always exhibit a certain deviation from the tissues in which they are found. In other words they are heterologous within narrow limits. The embryonic character of the cells also explains the well known instability of the tumor, which, though classed among benign growths, has a tendency to take on malignant action, the transformation occurring in the direction of the sarcoma.

True myxomata have to be distinguished on the one hand from tumors, such as fibromata, sarcomata and carcinomata, that have undergone secondary mucinous degeneration; and on the other, from growths that, owing to vascular disturbance, have become edematous. Myxomata (fibro and lipo) may originate in the connective tissue of the skin, fascia, periosteum, mucous membranes, and muscle sheaths; in the subcutaneous and subserous fat, the bone marrow, and, occasionally, in the mamma, salivary glands and testis.

Myxomata of the mucous membranes occur singly or as multiple primary tumors. The ordinary mucous polyp of the nose is a good example of these growths. Myxosarcomata, so-called, are due either to a cellular transformation of a simple fibromyxoma, or to the mucinous degeneration of a sarcoma. They behave as sarcomata and form metastases."

This last account, as will be seen, gives an excellent description from the laboratory standpoint, but does not deal with the history of the growth, its effect upon the general health of the patient, the prognosis, or the best method of dealing with it. In this case we have a tumor of at least seven years' duration, practically painless, with no glandular enlargement, but extending out in many directions, apparently non-encapsulated, and destroying the bone tissues which it invaded very much as would a malignant growth. Again, it has repeatedly healed after curettement and has never shown any tendency to ulcerate, both of which facts rather disprove the thought of malignancy. Dr. Wright's report, having been made after examination of several pieces of the growth, also indicates the benign nature; and yet the question is, where can we draw the line between benign and malignant tumors? It seems to me that any growth that can so effectually absorb the bone tissue, that returns repeatedly after operation (the thoroughness of which, however, I cannot vouch for), that appears to be without capsule and ramifies in bone, muscle, open space and fibrous tissue alike, does not belong in the benign class, and should be considered more seriously than has been done up to the present time. Bland Sutton's theory of a pericementitis being the cause or the starting point may seem to be borne out in this case, as its history of wisdom toothache preceded the growth. Dr. Cramer first noticed it while filling a cavity elsewhere and advised that it be attended to. If there is no recurrence after this extensive removal, it will be very easy to fit an obturator over the remaining cavity, with attachments to the opposite side, and with a complement of teeth that will give use for mastication, and at the same time will support the cheek if there should be much sinking in.

LVI.

A REPORT OF ELEVEN CASES OF CEREBRAL
COMPLICATION DUE TO ACUTE AND
CHRONIC SUPPURATION OF THE
MIDDLE EAR. WITH COM-
PLETE ANALYSIS
OF FIVE.*

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In 53 mastoid operations, 17 of which were for acute mastoiditis, 36 for chronic suppurative otitis, I have found 11 cerebral complications divided as follows:

Extradural abscess, 6.

Serous meningitis, 2.

Purulent meningitis, 1.

Infectious sinus thrombosis, 2.

I wish to say at this place that all the cerebral complications developed as the result of delayed operation, and none of the cases that were operated early had complications at all. The chronic suppurative otitis cases that developed cerebral complications had cerebral manifestations prior to operation.

Extradural abscess and perisinus abscess I group in the same class. Anatomically the same, clinically they differ.

Four of the cases were perisinus abscess. Two of this group were further complicated by other cerebral affections and will be reported in full. One case of perisinus abscess with granulation tissue on the sinus was complicated by a Bezold's abscess. One case of perisinus abscess without any other complication. Two of the cases were from acute infections, one of which followed fracture of the base of the skull.

The remaining two cases were the result of chronic suppurative otitis.

*Read in the Section of Ophthalmology, Otology, Rhinology and Laryngology, California State Medical Society, April, 1907.

Two cases of extradural abscess were in chronic suppurative otitis. One case had such symptoms that an extradural abscess could be suspected; and was found at operation by a small fistulous communication. The other case was accidentally discovered by uncovering the dura in the middle cerebral fossa.

Two cases of serous meningitis from chronic suppurative otitis.

One case of purulent meningitis from chronic suppurative otitis.

Two cases of infectious sinus thrombosis in acute suppurative otitis.

CASE 1. Female, aged 21. Had ordinary diseases of childhood. Acute otitis following scarlet fever at the age of 8. The discharge continued uninterrupted for two years. Adenoids were removed and drops were used in the ear which remained perfectly dry for one year. Since that time the ear has discharged more or less. Examination: Weber lateralizes to good ear. Schwabach somewhat shortened. Rinne right ear positive, slightly shortened bone conduction. Rinne left ear negative, considerably shortened bone conduction, very much shortened air conduction. Right ear whisper 25 feet; left ear whisper on contact. Acoumeter on contact. Right ear apparently normal. Left ear caries of the attic wall with a fissure extended into the same. Some granulation tissue about this fissure with the tendency to bleed on manipulation with probe.

January 19, 1905, radical operation, closing by Körner flap. Posterior wound healed by primary union. On removing the periosteum from the mastoid, the bone showed a dark blue color. This was produced by the carious necrotic mass of the mastoid cell. The outside shell of bone was more porous than under normal conditions. The hammer and incus were almost completely destroyed by caries. There was a fistula posteriorly and below the facial nerve which could not be eliminated as it would have destroyed the facial nerve. However, it was curetted as well as possible by the use of straight and curved curettes. I wish to direct particular attention to this lesion, as I consider it wholly responsible for the symptoms that will be recorded later. The wound was dressed every second or third day. The patient complained of so much dizziness and headache and pain on the side of the head that she remained in the hospital for thirty days. I attribute some of the headache to a compound astigmatism which was partially

relieved by the continuous use of her glasses. While in the recumbent position she was not dizzy. When she assumed an erect position she would become very dizzy and at one time fell from her chair. This can be accounted for in but two ways, first, that of injury to the semicircular canals at the time of operation,—or secondly, to an infection which I believe most likely took place by way of the fistula which I described before.

Twenty-four hours following operation she was reported by the nurse to be delirious. This happened two or three times in the course of that many days and she complained of headache, and soreness about this side of the head which gradually subsided. When she began to walk her gait was that of a person with a fractured pelvis. She is a highly sensitive, hysterical woman, and I attributed part of the cerebral manifestations to her mental condition. The eye background was perfectly normal.

March 27, 1905, the ear absolutely dry; hearing unimproved.

May, 1905, seropus began to discharge from this fistula and continued until September, 1905, at which time I again performed a curettement. This was treated antiseptically until November, 1905, when she was again discharged as cured. Since the recovery from her primary operation she has had no cerebral symptoms of any kind. March 2, 1906, complains of intense headache over this side of the head and dizziness a great deal of the time. The whole of the temporal bone on this side was tender to pressure and the slightest percussion would elicit excruciating pain. At this time there was a serous discharge from this fistula, which in the course of two weeks disappeared entirely. The cerebral symptoms continued with acute exacerbations, at times so severe as to require morphin. Her pulse repeatedly reached 50, full and strong. She had some vomiting which was probably due to the morphin. Examination of the eye negative. Physical examination negative.

At repeated consultations operative procedure was recommended by all but one physician, who maintained that it was due to a nervous manifestation.

May 15, 1906, patient entirely well. Cerebral symptoms entirely gone.

Diagnosis.—Serous meningitis by way of the fistula to the semicircular canal and the aqueductus vestibuli. This will explain the cerebral symptoms that followed the primary opera-

tion as well as the cerebral symptoms that followed in the later infection. During the first infection the cerebral symptoms were scarcely sufficient to warrant further operative procedure, because they seem to improve almost daily after the second or third day. However, when we are confronted with cerebral symptoms later, and the only possible source of infection is by this fistulous communication, it must be admitted that it was by this route. Furthermore, the patient had an association of cerebral symptoms, such as dizziness, headache and localized pain on the affected side, which should always lead you to suspect cerebral complications, especially when all the mastoid cells had been removed. If it is not today, it will be in the near future considered conservative surgery to open and explore.

My diagnosis prior to her recovery was different. At this time I thought she had an extradural abscess or brain abscess, with a decided leaning towards extradural abscess of the posterior brain fossa by way of the semicircular canals and the aqueductus vestibuli. No doubt the infections travelled this route, but was a nonbacterial invasion. I wish also to call attention to the fistula which was discovered at the primary operation and which has apparently been responsible for the infection that followed. Should it have been destroyed entirely at the sacrifice of the facial nerve, to remove all possible source of cerebral affections to follow? Or should we trust in Providence, as I did in this particular case, and almost lost my patient?

In conclusion I will say that by early operation in cerebral affections, you may cut short or eliminate entirely your source of infection, while on the other hand, if it is allowed to remain, there is but one termination, and that is death with but an occasional exception, such as I have illustrated.

CASE 2. E. H., male 28 years, clerk by occupation. Dr. Rene B'ne, of San Francisco, very kindly furnished me with the medical history of this case, as well as the working out of the various nervous manifestations. Had measles at 17, which were complicated with pleurisy. For two years was in the tropics in good health. On his return to San Francisco three years ago had malaria. For the last two years he has been about San Francisco; he has lost 30 pounds in weight during the last three years. Present weight 128. Height 5 feet 7½ inches:

Present illness began about three weeks ago with cough, especially at night, and progressive weakness. Appetite good until one week ago. He had no night sweats, no chills, but a chilly feeling when out of the sunshine. No diarrhea or constipation. No digestive disturbance except vomiting following the cough. Frequent urination, particularly during the day time. Has excessive dyspnea on the slightest exertion. No subjective cardiac trouble. Has had chronic discharge from the ear for the last two years. It seemed to start as a chronic affair. Never complained of pain or tenderness on this side of the head. About three weeks ago had to give up work because of absent mindedness. About three months ago began to see double at intervals. These intervals have increased in frequency up to the present time. The physical examination I will not record, as it was a clear picture with findings of pulmonary tuberculosis.

Examination December 29, 1905.—Pupils, dilated and unequal, respond to light and accommodation. Left dilated more than right. January 3, examination by myself. Pupils dilated, left more than right. The assistant says dilated more than three days before. Respond to light and accommodation. Apparently no vision of the right eye. Slight lateral nystagmus. When finger is held below the level of the good eye sees double, otherwise normal. No changes in the disc apparent. January 2, 1906, it was noted that the right eye could not be completely closed. The lower lid drooping and the upper lid with little resistance. Facial paralysis of the right side. The lines of the forehead and cheek were obliterated. Mouth drawn to the opposite side. Left side of face slightly flushed and warmer than the right. Neck very rigid. Regarding flexion of spine it moves as a whole. Patient can be raised to the sitting posture without flexion of the spine by the hand behind the head. Patient cries with pain when the neck is forcibly flexed. Head rotated slightly to the left. Reflexes of right arm present and normal, considerable spasticity. Reflexes of left arm normal, no spasticity. Right patella reflex slightly accentuated with spasticity. No marked Oppenheim on the right. Questionable Oppenheim on the left. Questionable Babinski on both sides. No ankle clonus. No patella clonus. Achilles tendon reflex very slight. Cremaster reflex absent on right, very active on left side. Abdominal reflex not elicited.

Examination of the Ear.—Discharge of foul-smelling pus from the right ear. The posterior superior wall of the meatus was so swollen that it formed an ellipse instead of a circle. The tympanic membrane could not be seen. Some pain on deep pressure over the tip of the mastoid.

Diagnosis.—Probable meningitis with possibility of brain abscess.

January 4, 1906, patient unconscious for the last twenty-four hours. Paralysis of the opposite side and partial paralysis of the same side. Radical mastoid operation. Pus under considerable pressure. Mastoid cells full of granulation tissue, and a cholesteatoma mass. Dura of the middle fossa uncovered very easily. Dura bulged into the operative field so that the edges of the bone could not be seen. No pulsation of the brain. Dura incised. Large quantities of serous fluid escaped. The brain still bulged into the dural wound. Was incised in three different directions, followed by the escape of considerable serous fluid, which undoubtedly came from the lateral ventricles. There was some question as to the possibility of tubercular meningitis because of the lung tuberculosis. This is of course possible. However, in a case of chronic purulent discharge from the ear with localized pain, facial paralysis and bulging of the posterior superior wall, all of which speak for pus retention, we must at once assume that such is the case and deal with it accordingly. I am not inclined to think that this was a tubercular infection of the middle ear because it began as a chronic discharge. There was no acute manifestation of an inflammation. This is in accordance with tubercular infection of the ear. On the other hand, he had measles when 17 and it may be that he had an acute otitis then and that it had been more or less quiet until two years ago. The finding of the cholesteatoma speaks for the latter. My opinion, based upon literature, leads me to believe that this latter is the correct solution. The man died twelve hours following the operation. The microscopic postmortem findings did not reveal any giant cells in the part of the dura or the brain that was examined. There was no exudate. From our findings and our lack of findings we must conclude that it was a serous meningitis dependent upon ear infection.

CASE 3. L. B., male, age 12. When 5 years of age had scarlet fever, which was complicated by an acute suppurative otitis. Otherwise perfectly well. The ear discharged more

or less for the following four years. At times it would completely subside. The ear would remain perfectly dry from three weeks to two months, when he would have more or less pain in the mastoid region which would be followed by a discharge. Sometimes this pain was very slight and sometimes it was distributed to the whole of the temporal bone on this side of the head. During the four years the pain was never severe enough to keep him in bed. Many times with the subsidence of the pain the discharge from the ear would cease. During the last three years there has not been any discharge from the ear. However, he has had six distinct attacks of fever and pain in the region of the mastoid and tenderness increasing in severity with each attack. They usually last two to four days and the patient is up and about. The present attack is much worse than the former one. He has not been able to sleep for four days because of pain and tenderness on this side of the head. Temperature $102\frac{1}{2}$, pulse 120. Examination: Right ear normal, left ear stands out from the head more than the right ear. Hot to touch in comparison with the other ear. The whole of the temporal bone sensitive to pressure and extremely so at the tip of the mastoid. Drum membrane entirely destroyed and part of the attic wall. The ear is perfectly dry. An unusual fullness between the inner wall and the attachment of the tympanic membrane posteriorly. Weber in bad ear. Schwabach lengthened. Rinne, right ear positive, about normal. Rinne, left ear negative, lengthened bone conduction, shortened air conduction. Whisper right ear 30 feet, left ear four feet. Immediate operation recommended, which was done following morning.

February 5, 1907, 11:30 a. m. Radical mastoid operation, closing by the Panse flap. Large pneumatic mastoid. The attic and antrum were filled with cholesteatomatous masses. The large and small mastoid cells as well as the cells about the zygoma were filled with cholesteatoma. There was but little pus at various places throughout the mastoid. All the cancellous bone was removed. The sinus was accidentally uncovered. Operation completed.

During the afternoon and evening, patient complained considerably of pain on this side of the head and in the ear. Vomited several times. Temperature dropped to 99.6. The following morning temperature 100.8, pulse 106, respiration 104. Complaining of pain in the ear and on the whole side of

the head. Vomited several times. Evening temperature 100.4, pulse 96 and respiration 24. Second, third and fourth days cerebral symptoms presented increasing in severity from day to day. Complains of pain almost constantly, dizziness a great deal of the time. For two nights the pain was so severe that morphin was necessary to keep him quiet. The fourth day the right pupil more dilated than the left, reacts to light and accommodation. The papilla of the left eye more injected than the right. White blood count 20,000. Bacteriologic examination of pus in mastoid, streptococci. On the evening of the fourth day a second operation was done for purulent meningitis. On exposure of the dura it was found to be red and inflamed. The bone was removed until healthy dura was uncovered. The uncovered area was somewhat larger than a silver dollar. The dura bulged into the cavity made by the removal of bone and no pulsation was noted. The dura was incised and at the same time a meningeal vein was cut which gave considerable trouble in ligating, so as to what escaped I am unable to say. A culture was made which proved to be streptococci. After the hemorrhage was stopped the brain pulsation was quite normal, and the operation brought to a close. Salt infusion per rectum administered. The reason the brain was not incised was that it did not protrude and that there was no pulsation.

Vomited some during the night. Did not complain of pain during the night. Pupils normal in the morning.

Fifth day: Temperature 102.2, pulse 102, respiration 24. Complains of pain in the head occasionally. More rational than before operation. Temperature 100.8, pulse 72, respiration 18.

It will be noted that the temperature has increased rather than diminished. All this speaks of further infection and possibly more active because of the operative interference. From the fifth day to the eleventh, the cerebral symptoms continued to increase. Headache and pain on the side of the head almost constantly. Delirium increasing in severity from day to day, rational at times. Twitching of the muscles of both sides of the face, hands and arms. The following day paralysis of the hand and leg of the opposite side. Nystagmus. Cannot see at all. At intervals rational, when he complains of pain. This condition increased in severity, complete paralysis of both sides, complete blindness and no rational moments. Following

the second operation the cerebral symptoms were more pronounced. My explanation of this is that the meningeal infection became more aggravated, which is the usual course. This case illustrates very well what disastrous results follow in neglected cases. No doubt this boy had meningitis a long time before he was operated. His temperature never fell to normal. The lowest was 99.6, the morning following operation, increasing a few tenths every day with increasing cerebral symptoms. Had the infection taken place from the operated area the fever would not have appeared so soon. The same is true of all surgical affections. From a misunderstanding autopsy was not secured.

CASE 4. J. C. S., male, 75 years of age. Medical history by Dr. H. C. Moffit. Father and mother died in old age. Mother died at 70 from malaria. No severe sickness in family. Patient has always been well. No pneumonia or typhoid. Was in the army and had a sword wound over the left parietal. Has had malaria. Denies specific history. Five months ago had an acute suppurative otitis of the left ear. Has had headache over this side of the head ever since. At times it is very severe. The severe spells come every third day and are increasing in severity. Pain only on this side of the head. Memory failing. Hearing gone in left ear. Pain in left occiput, running down neck. Appetite is poor at times, due to nausea. Has no vomiting spells. Bowels regular, urine negative. Has noted laryngeal cough from fluid discharged in the pharynx. Has no dizziness. Has lost forty pounds in four months. Tenderness at back of neck when pain is felt. Has had to take morphin constantly for the last two months. No temperature nor chills. Examination: Pale, emaciated, evidently in much pain. Holds head stiff. Cannot bend it forward without much pain. Tenderness over the upper three vertebrae. A little swelling slightly to the left of the upper three vertebrae as well as back of the mastoid. Most tender between mastoid and vertebrae and on deep pressure is felt a swelling that feels partly periosteal and partly of the soft part. Along the anterior and the posterior borders of the mastoid are glands dwindling from above downward, the largest the size of a bean, somewhat tender. Pain along left jugular, but no tenderness. Pulse in jugular. Pupils small from morphin, but react to light and accommodation. No nystagmus. Fundus not examined. Skull not tender. No facial nor trigeminus

paresis. No change in reflexes. No swelling of vertebrae from the mouth. Examination of nasopharynx leads to a discharge of considerable quantity of pus.

Probable Diagnosis.—Extradural abscess; sarcoma in the posterior fossa; necrosis of the atlas or a sinus affection.

Ear Examination by Myself—The ear stands out from the temporal bone more than the ear from the opposite side. This ear is hot in comparison with the ear of the other side. Some swelling of the mastoid but particularly back of the mastoid. Sensitive over the whole of the mastoid, but especially back of mastoid. Some pain down the side of the neck. The pus is small in quantity and very offensive. There is decided bulging of the posterior superior wall. A small perforation in the tympanic membrane. Weber in bad ear. Schwabach lengthened in bad ear. Speech on contact in this ear.

Operation September 15, 1905. Radical operation. Started to do the operation for acute mastoiditis. However, I changed it into a radical operation because the pathologic findings were so extensive that I thought it could not be thoroughly removed without the latter procedure. Pus under the periosteum. The perforation was near the tip of the mastoid. On removal of bone, pus and granulation tissue welled into the cavity uncovered. The individual cells were largely destroyed and instead a large cavity was present. In curetting away the granulation tissue I suddenly encountered more pus under considerable tension. After further curettement I was able to demonstrate that this latter pus was in the sinus and separated from the pus in the mastoid by granulation tissue. I curetted the jugular end of the sinus as far as my curette would go and packed with iodoform gauze. The other end of the sinus was nicely sealed and the patient had no symptoms of pus infection, so the clot was not disturbed. The jugular was not ligated for the same reason. The only explanation that can be offered for this is that of a pneumococcus infection. Alexander, of Vienna, reports a similar case about two years ago, saying that he had made a thorough search of the literature and was unable to find a similar case on record.

The patient made an uninterrupted recovery. He did not have any chill, fever, or sweat during his entire illness.

CASE 5. Male, age 33, machinist by occupation. Had ordinary diseases of childhood. Has never been ill so far as he can remember. On January 21, 1907, while slightly under the

influence of alcohol, he fell, striking the back of his head. Says that he was somewhat dazed for a time and noted that he had a discharge of blood from the right ear. The following day he noted a serous discharge from the ear which was tinged with blood. Also noted that he could not hear so well from this ear as formerly. Three days following the injury had a chill and some fever. Some pain in the ear and some pain in the mastoid region. This subsided gradually during the course of ten days, and he returned to work for a short time, when he again had pain and tenderness back of the ear. Stopped work for three or four days and then again felt quite well. This fever, pain and tenderness has continued interruptedly for the last six weeks. Three days following the accident, pus began to discharge from the ear and it has continued up to the present time and is of a very offensive odor. There has always been more or less pain confined to this side of the head. At times much exaggerated. Of late the pain is increasing in severity and occurring more frequently. For some days past says he has had fever. No chills or chilly sensations.

Ear Examination.—No swelling of the soft parts about the mastoid. No increased surface temperature. Slight tenderness over the whole of the temporal bone. Very sensitive over the tip of the mastoid. There is an offensive discharge from the small perforation below the end of the hammer. The tympanic membrane was bulging to such an extent that the landmarks were completely obliterated. The bulging of the posterior superior wall was so marked that it helped to obliterate the membrane. Temperature 102.5, pulse 110. Operation recommended.

As the following day was Sunday we did not operate until Monday, his temperature remaining near 103 the whole of the time.

Acute mastoid operation. Nothing of note on removal of the periosteum. After removing the outer shell of the mastoid a blood clot was found that was partly broken down and intermingled with pus. The clot began just back of the posterior osseous wall of the meatus, extending horizontally across the mastoid to the wall of the sigmoid sinus. On removal of the blood clot, granulation and pus, the fracture could be traced through the posterior osseous wall of the meatus, crossing the mastoid, fracturing and uplifting that part of the mastoid that covers the sinus; between the sinus and the

broken bone there was pus and new organized connective tissue covering part of the sinus wall. The sinus was uncovered until it appeared perfectly healthy. There was pulsation in the sinus and it was compressible. The balance of the mastoid cells and the cancellous tissue was removed and the antrum opened freely, and the operation completed.

The temperature chart did not drop as was expected. Wound dressed the second day following operation. No pus in the external meatus; everything looking well in the mastoid wound. The third day, the temperature remained about the same. I decided that the sinus could be explored the following morning. When I called on the fourth day the temperature had fallen considerably and the patient was feeling very comfortable. I decided to postpone further operative procedures. In less than half an hour following my visit, the patient had a chill and the temperature went up to 104. This temperature chart illustrates very beautifully the rise and fall of the temperature with the chills and the perspiration that followed. During the fifth day the patient began to experience pain in the right knee, which was bandaged and had hot applications applied. The following day, six days after first operation, I decided to open the sinus. The new granulation tissue was curetted away, all parts made clean as possible, pulsation could be felt in the sinus. Besides it was compressible. There was no pain along the jugular at any time. The lateral sinus was freely incised, the jugular end of the sinus did not bleed as much as the other end. At any rate, I concluded that there was a partial thrombus and I curetted and packed with iodoform gauze. The distal end was plugged without curettement. The jugular was ligated and the operation completed. The following day, patient had a chill and temperature of 104. The same day the knee was punctured and the secretion showed to contain a pure culture of streptococcus. The knee was freely opened the following day. There was considerable bloody pus found. It will be noted that there was a decided fall in temperature following this operation and another rise about two days following this knee operation. I account for this by the fact that the mastoid wound had not been dressed for three days. It will be noted that there was a gradual fall following this new dressing. Dr. Alvaris has done some bacteriologic work for me on this case, of which I wish to speak. Jarueh and others have recently been studying the polymor-

phonuclear neutrophiles and find that the number of neuclei vary considerably under different conditions and in different diseases. There are five classes of cells with 1, 2, 3, 4 and 5 neuclei respectively, the percentage of the classes and the average number of neuclei to a cell vary. Normally the count varies only slightly from the following:

I	II	III	IV	V
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5	35	41	17	2	Average number per cell 2.76.
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The polymorphonuclear neutrophiles are supposed to develop from small myelonotic cell with single oval nucleus. A few of these are normally found in the blood. The older the cell presumably the more neuclei it has, and the older cells are supposed to be most active in the phagocytosis. If this be true a large percentage of multinucleate cells would give a good prognosis, as the person ought to be more resistant to infections. This seems to be borne out clinically but an immense amount of research must yet be done. A bad prognosis might have been given in Dr. Welty's case with pus and streptococci in the knee joints, but the differential neutrophile count showed the following percentages:

I	II	III	IV	V
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4	24	34	25	13	Average number 3.19.
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As the average number seldom goes over three, the prognosis for this count was good. This was borne out subsequently. A blood culture was negative three days later. Probably the circulating streptococci had been destroyed very quickly.

2510 Washington Street.

LVII.

THE TECHNIC OF THE COMPLETE MASTOID OPERATION—IMPROVED, SHORTENED AND SIMPLIFIED, THROUGH THE DIGASTRIC ROUTE.*

BY WM. SOHIER BRYANT, A. M., M. D.,

NEW YORK.

The complete mastoid operation fulfills the requirements oftener and better than any other. It removes not only the macroscopically diseased bone and cells, but also those structures which show bacteriologic changes only when seen under the microscope. It is therefore the surest method of avoiding labyrinthine or sinus involvement or secondary operation, and is the one which I usually perform. The conventional incision through the skin and outer table of the mastoid process, followed by excavation of the antrum, is perfectly satisfactory when we do not intend *a priori* to remove the tip of the process and all of the cells, in spite of the fact that the knee of the sinus occasionally lies directly in the path of the operative procedure. But when it is previously decided to remove the tip, together with all the cells, I have found that the time of the operation may be shortened and its technic simplified, by attacking the bone, penetrating the outer cortex, and opening the process at the tip first.

I make the skin incision close to the posterior fold of the auricle beginning at a point on a level with the upper wall of the meatus. The incision is then carried in a curved line downwards and forwards to a point level with the tip of the process. The periosteum is next incised at the bottom of the wound on a line corresponding to the skin incision. Then, the periosteum is lifted carefully, beginning at the tip of the process and working upwards, extreme caution being taken that it be in even sheets. After the anterior and posterior periosteal flaps have been loosened, the periosteum is lifted from the mastoid process entirely, the operator working around under the tip and up to the bottom of the digastric

*Read before the American Otological Society, 1907.

fossa. Next with a medium sized rongeur the tip is quickly removed, and then the outer table of the cellular area. The cells in the base of the process are now broken down with the rongeur and cleaned up with the curette, thus fully exposing the antrum.

The possibility of opening the sinus is thus rendered quite remote even when it is situated much farther forward than is normally the case. If the knee of the sinus encroaches upon the posterior wall of the meatus too closely to allow easy entrance to the antrum by the usual route, the latter can be readily approached from below.

If the process is pneumatic our best tool is the rongeur. It will accomplish the breaking down of the tip and the removal of the outer table and cell structure more quickly and better than any other. If the mastoid is sclerosed the tip is removed with the rongeur but time can be saved if the electric burr is used to do most of the remainder of the bone work.

Another advantage in the digastric route for opening the process lies in the fact that one can locate the position of the facial nerve at its exit from the stylomastoid foramen, because in uncovering the digastric fossa in the beginning of the operation, the stylomastoid foramen which is situated at the anterior or inner end of the groove is readily found.

Moreover, we find convalescence greatly facilitated and shortened by the preservation of the periosteum together with free incision of the drum membrane. Post-operative hearing is best if the attic is entered from behind and is not explored, especially if the convalescence chances to be rapid. Post-aural scars are reduced to a minimum by closure of the wound at the time of operation.

I have found that this technic consumes the least time consonant with good operative results and that the convalescence is all that can be desired in rapidity as well as in auditory and cosmetic efficiency.

LVIII.

A CASE OF MASTOIDITIS AND EPIDURAL ABSCESS; OPERATION AND RAPID RECOVERY.*

BY W. SOHIER BRYANT, A. M., M. D.,

NEW YORK.

At the last meeting of this society there was some slight feeling of doubt upon the part of certain members whether one of the patients I showed was really alive or not. In order to remove this doubt and to assure these gentlemen that she is very much alive, I have taken the liberty of presenting a short history of the case.

June 19th, 1906. Patient a girl of 16 years, well developed and well nourished, with partially occluded nasal fossae due to a deflected septum.

History.—Recurrent purulent otitis. For four weeks she has manifested very slight mastoid tenderness associated with a little pain. Inspection shows a very thick bulging nipple of the drum membrane filling the canal.

Operation.—Advised and acceded to. A very free incision of the membrane was made. The skin was then incised behind the auricle down to the periosteum after my usual method. The periosteum was lifted from the mastoid. The bone felt rough but there was no abnormal amount of bleeding. When the cortex was perforated, about one dram of greenish pus welled out under pressure. The cortex was of medium thickness, the tip of the process and all the cellular structures were soft and full of granulations, and the surrounding bone was also soft and injected. The whole tip was removed and the sigmoid sinus was bared from the knee almost to the bulb. It appeared red, was sparsely dotted with granulations, and was soft and resilient to the touch. There were no occipital or epipetrosal cells and very few zygomatic cells. There was a perisinus abscess at the lower border of the knee of the sinus; the inner table was found absent over an area about as large as a dime. A small abscess was evacuated near the

*Read before the American Otological Society, May, 1907.

bulb posteriorly. All the cells were removed and the antrum opened; the antrum and attic were curetted. The dura mater was also exposed over the tegmen. Finally the posterior osseous wall of the meatus was taken down and the facial ridge curetted down to the facial nerve. The wound was washed with lukewarm normal saline solution which was allowed to remain in it. Blood for the blood-clot was supplied by rubbing the edge of the wound. A small cigarette drain



No. 1. Right Side. After Operation.

was passed from the antrum to the lower angle of the wound which was closed by a continuous subcutaneous silver wire suture and covered with gauze moistened in normal salt solution. Light packing in the canal. Rubber tissue was laid over all, then a layer of absorbent cotton held in place by a firmly applied bandage.

Convalescence.—The dressings were changed every day; the wet dressing was not re-applied.

On the second day the outer dressings were dry and every-

thing looked well. The patient was out of bed and sat up in a chair.

On the third day the drain was removed and the patient remained up all day.

On the fourth day the meatus was found dry and the hole where the drain had been was closed. Boric powder was insufflated in the meatus.

The wire suture was removed without any pain on the fifth day.



No. 2. Left Side. Not Operated Upon.

The patient went home on the sixth day. The course of the convalescence was so uneventful and rapid that one is led to the belief that the wound would have healed quicker without the drain.

On the seventh day dermatol and boric powder were insufflated on the drum membrane. The drum membrane had not yet healed; it was uneven, and allowed a trifling serous leakage. Boric powder was applied. The dressing and band-

age were left off and replaced by a small cotton cocoon. The watch was heard at 20 inches.

Post-Convalescent Notes.—On the eighth day all form of dressing was permanently discontinued and the patient was shown to the American Otological Society at the Academy of Medicine. The watch was heard at 18 inches, and the drum membrane was dry and pale.

The watch was heard at 36 inches on the ninth day.

On the eleventh day the watch was heard at four feet. The watch was heard at five feet on the fourteenth day. There was some tenderness and the tympanic membrane was thick and depressed.

All crusts had desquamated, and the scar was clean, linear and scarcely visible on the sixteenth day. The watch was heard at $5\frac{1}{2}$ feet.

On the fifty-ninth day, the scar was linear and the surface flatter than upon the sound side. The watch was heard at $8\frac{1}{2}$ feet. The drum membrane had cleared off well, but was still depressed and thick. Patient said she had had constant singing tinnitus since the ear began to discharge. Valsalva inflation negative. Politzerization positive. Examination of the nose and throat showed large tonsils and some adenoid tissue; the right middle turbinate was large and covered with muco-pus. The nasal septum was deflected to the affected side.

Seventy-first day. The post-aural surface had sunk a little, but it remained even. No regeneration of bone was apparent. The patient had sizzling tinnitus. The watch was heard at five feet. Hypertrophic rhinitis was marked and there were signs of postnasal catarrh. Valsalva inflation was positive and improved the hearing slightly, but did not move the malleus. It brought the posterior part of drum membrane a trifle nearer to view.

On the one hundred and twenty-eighth day the scar was scarcely perceptible. The drum membrane appeared normal, except for the opaque cicatrix in the posterior segment. The mastoid process seemed to have filled out somewhat since last examined. A watch was heard at five feet. She complained of frontal headaches. The turbinates were nodular and hypertrophic, and the mucous membrane was pale. Transillumination showed cloudy frontal and maxillary sinuses. The pharynx was dry.

Two hundred and forty-third day. Valsalva inflation nega-

tive. The watch was heard at $6\frac{1}{2}$ feet. The tympanic membrane looked very well.

Three hundred and fifteenth day. No scar discernible on post-aural surface. The watch was heard at 11 feet in operated ear.

Summary.—The convalescence from the mastoiditis and epidural abscess was complete in six days; the operation wound healed by first intention in three days.

The convalescence from the middle ear was more prolonged, lasting seven days, with a final result of good hearing. The subsequent health of the patient has been an uneventful continuation of the aural conditions, which are good considering the nasal obstruction which was the primary cause of the disease. General health always excellent. The nasal condition was purposely not treated in order not to affect the post-operative processes of repair.

LIX.

A CASE OF SUPPURATION AND NECROSIS OF THE LABYRINTH—OPERATION—RECOVERY.

BY GEORGE LORING TOBEY, JR., M. D.,

AURAL ASSISTANT SURGEON TO THE MASSACHUSETTS
CHARITABLE EYE AND EAR INFIRMARY,

BOSTON.

August 15, 1907. M. P.; female; unmarried; 19 years of age. Seen in consultation for Dr. Croston, of Haverhill.

History.—At six weeks of age she had a right otitis media suppurativa; the ear continued to discharge for eight or nine months, when there was a succession of small post-aural abscesses, which were lanced by the family physician. The abscess eventually healed; the ear, however, continued to discharge, more or less, for four years, when she was seen by Dr. Clarence Blake, to whom I am indebted for the following record: "I saw M. P., four years of age, on March 17, 1893, on account of a suppurative process in the right ear with sequestrum formation on the posterior canal wall. This sequestrum measured six by eight millimeters in superficial area and extended to a depth of four millimeters into the cancellated structure of the bone. The operation consisted in its removal and the curetting of the resultant cavity down to firm tissue, with uneventful healing."

Following this operation, the ear was dry for six years. In the fall of 1899, following an attack of la grippe, the right ear began to discharge freely, no other aural symptoms being present.

The discharge continued during the winter, and early in the spring (1900) she was taken suddenly in school with severe headache, vertigo, nausea and vomiting; at this time she could walk with difficulty, but found that it was impossible to go up or down the stairs. She was confined to her bed for several days, owing to the nausea and headache; the vertigo was in no way influenced by the position of the patient; in so far as can be ascertained, there was no elevation of

temperature. The symptoms gradually disappeared and she was up and about within ten days. The hearing, which was impaired before, was not noticeably diminished by this attack.

Several weeks after this attack she discovered that when she attempted to lift anything or leaned far forward, she became very dizzy and would have to lie down for half an hour to an hour, at the end of which time she felt all right. This latter, together with a profuse discharge, continued with no other symptoms for two years. In the spring of 1902, following slight exertion, she was taken with very marked vertigo, nausea and headache referred especially to the occiput. The loss of equilibrium was so great that she was unable to stand without support, everything seemed to be revolving about her as the center. There was no temperature nor chills and the character or amount of the discharge changed in no way. The vertigo was present at all times and was in no way affected by position. There was at this time slight diminution in the hearing.

During the last six years similar attacks have occurred at intervals and the vertigo has been present to a greater or less degree since the very severe attack in 1902. The discharge from the middle ear has been constant, at times very foul and at other times mucoid in character.

Four or five months ago she noticed that the vertigo was more marked and that she was not quite sure of herself when walking. At this time she found in leaning over her bed that on reaching an angle of about 80 degrees her sense of equilibrium was lost. She then experienced a whirling sensation and fell forward on the bed. This occurred not once but invariably, and the patient tried it repeatedly. This whirling sensation was accompanied by slight nausea, which passed off in a few moments.

There was an increasing tendency upon the least exertion to a slight loss of equilibrium and a sensation as if the objects around her were moving in their own horizontal planes about her as a center.

Three weeks prior to August 19th she was taken with a severe chill lasting for twenty minutes, the temperature was not ascertained; very severe shooting pains radiated from the right ear toward the occiput; there was a fainting sensation with nausea and occasional vomiting. The loss of equilibrium was so marked as to confine the patient in bed;

there seemed to be an irresistible force causing her to whirl toward the right and at the same time she would fall, or, to describe it more accurately, collapse. All objects, even the floor and ceiling, seemed to be revolving to the right; that is, toward the affected ear. The whirling sensation was not affected by her position and was present with the eyes open or closed. The slight hearing which had remained in that ear was entirely lost. There have been no subjective noises in the ear within the patient's memory.

The very acute symptoms disappeared in six or seven days. The equilibrium improved somewhat so that the patient was able to walk with some guidance, the sense of elevation was almost entirely lost, so that she stubbed her toes and found great difficulty in going up or down stairs. The headache lost its shooting character, became dull and grinding, but was not definitely localized. The bewilderment of which she complained during the last year had become very much more marked and everything seemed confused.

As she walked into my office her gait and general attitude immediately suggested a case of cerebellar abscess, which we see not infrequently. She was a well-developed and, to all outward appearances, a very healthy girl. When she stood with her feet and knees together she could stand perfectly still, but as soon as she deviated from the position she lost her equilibrium and fell if not supported, everything seeming to whirl to the right, carrying her with it. There was slight nystagmus to the left. The finer coordinated movements were normal, as were the reflexes.

Posterior to the auricle and over the right mastoid bone there were several small cicatrices. There was no tenderness nor edema over the mastoid, nor were there any enlarged cervical glands. A very profuse creamy discharge, foul in odor, filled the right external auditory canal; when this had been removed the canal walls were found slightly congested, but with no apparent infiltration. The membrana tympani was absent, as also were the ossicles. The internal wall of the middle ear was covered with granulation tissue of considerable thickness. The outer wall of the epitympanum was necrotic. No bare bone could be felt over the promontory, but the probe was passed through the fenestra rotunda and its withdrawal was followed by the escape of a small amount of pus.

Operation.—August 19, 1907. Ether.

The usual mastoid incision was prolonged above in the line of the zygomatic process so that the auricle might be drawn downward and forward. The cortex was very rough and the periosteum was elevated with difficulty.

In doing the Stacke-Schwartze operation the bone was found to be sclerosed to a very marked degree, there being no cancellar tissue whatsoever in the mastoid portion. The antrum not being found at the usual depth and in the usual position, I decided to expose it by following along the posterior canal wall, this latter was removed by means of the rongeur and chisel. The space usually taken up by the antrum was found to be filled by firm ivory-like bone similar to that of the mastoid bone and contiguous with it. The facial ridge was shaved down as close as possible to the descending portion of the facial nerve. The horizontal semicircular canal was literally carved out of the firm bone surrounding it, there being no cancellar tissue surrounding the prominence as is usually the case. It was very evident that there was no erosion or necrosis of this canal, externally at least.

The outer wall of the epitympanum was removed to a level with the tegmen, granulations were removed from the epitympanum and the tegmen smoothed off with a curette; apparently, there was no exposure of the dura. The hyotympanum was also curetted and levelled with the floor of the canal.

The Eustachian tube was curetted, removing the granulations and mucous membrane. The whole cavity was packed with pledgets of cotton saturated with adrenalin-chlorid for a few minutes to control the hemorrhage from the granulations in the middle ear.

The bleeding having stopped, I was able to thoroughly examine the inner wall, which was covered with granulations. The stapes was not found, but the fenestra ovalis was filled with granulations, through which a small silver probe was readily passed into the vestibule; the withdrawal of this probe was followed by the escape of a small amount of pus.

The facial nerve, covered with granulations, was found exposed posteriorly and superiorly to the oval window, the intervening bone having been destroyed by necrosis, thus making the nerve one boundary of the niche; the anterior bony edge of the niche was soft and necrotic. The silver probe passed readily through the round window, the edges

of which were very soft and punky. The small bridge of bone between the fenestrae was *in situ* and was removed by means of a small gouged chisel. The bridge having been removed, the opening was enlarged by removing the outer wall of the vestibule and the lower portion of the promontory with the gouge (and curette), thus exposing the whole vestibule and the beginning of the first whorl of the cochlea.

The vestibule was completely filled with granulations and pus; these were removed with a small curette and the inner wall exposed, but no fistulae were discovered. The cochlea was cleaned out as far as exposed, but I did not care to risk further exploration of this part, owing to the danger of injury to the modiolus and internal auditory canal internally, the carotid artery anteriorly or the jugular below.

The horizontal semicircular canal was now further isolated by removing the bone well forward to the fallopian canal, the prominence was removed by means of a chisel, the applied force being in the plane of the canal and above the fallopian canal so as not to involve the nerve. The lumen of the canal on being exposed could be differentiated in no way from the firm white surrounding bone except by its outlines; there was apparently no fluid present nor were there granulations or blood. A small silver probe was passed through the canal and into the vestibule, passing around the small bridge formed by the ductus fallopii. I did not feel justified in opening the other two canals, as I felt that if the horizontal was not involved in the necrosis, the other had in all probability escaped and that the infection was limited to the vestibule and cochlea.

The cavity was next swabbed out with alcohol. A Körner flap was made from the membranous and cartilaginous canal, the whole cavity was firmly packed with small pieces of iodoform gauze in such a manner as to hold the flap in position in apposition with the posterior wall of the mastoid cavity. The original incision was closed by interrupted silk-worm sutures.

There was a good recovery from ether.

August 20th. There was a great change in the mental condition of the patient; the utter bewilderment and confusion which had been present for two years or more had entirely disappeared. As she aptly expressed it, "It seems as though I were in another world where everything is quiet

and peaceful." The vertigo, which had been constant, was not present when she lay perfectly quiet, there was no headache and the nausea was no longer present. The loss of equilibrium, on the other hand, was more marked than before the operation, it being impossible even to sit up in the bed without support, the sensation being similar to that experienced in a small boat in a choppy sea, unattended, however, by nausea. Slight nystagnus to the left persisted. Considering the granulations on the facial nerve and the manipulations in their removal, it is surprising that there was no facial paresis. The outer dressings were changed and she was given ten grains of potassium bromid every four hours and liquid diet for twenty-four hours. She complained of no discomfort during the day and slept well the following night.

August 21st. The equilibrium was slightly improved, as she could raise herself to a sitting position and retain it without support; this exertion was accompanied by a whirling sensation, but there was no nausea. There was retention of the urine, requiring catheterization when required; otherwise, she was very comfortable.

August 23rd. The improvement of equilibrium continued and she was able to stand alone, but could walk but a few steps without support. There was no headache nor nausea and there was no return of the confusion present before the operation; the retention of the urine persisted till this morning. She sat up in bed with little or no discomfort.

August 26th. Patient was up and about the room and walked into the next room with no difficulty whatsoever; her equilibrium was practically normal, there was no vertigo whatsoever, there had been no headache nor nausea since the operation, one week before. She could lean far over and regain the vertical position without difficulty and without experiencing the whirling sensation of which she complained previously. The outer dressing was changed twice during the week, but the packing in the cavity was in no way disturbed. The temperature had not been above 99 degrees since the operation.

August 27th. I decided to risk a skin-graft, and on August 27th, one week after the original operation, the patient was again etherized. The packing was removed from the cavity, which was found to be perfectly clean, with granulation tis-

sue springing up throughout. The Körner flap was firmly adherent to the posterior wall of the mastoid cavity.

One large graft, two by three inches, was taken from the right thigh and this was placed in the ear on a plug of gauze. The posterior incision having healed by first intention, the sutures were removed.

August 31st. Since the skin-graft three days ago the patient has complained of no pain, nor has there been any rise in temperature, consequently the dressing has not been touched. This morning I removed the gauze plug, on which the graft had been inserted, and the cavity was perfectly clean, the graft apparently having taken. The cavity, having been carefully dried out by means of cotton pledgets, was left exposed to the air, the patient having no dressing whatsoever on the ear.

September 2nd. The cavity has been dried out twice daily, there being only a very slight moisture, the graft has apparently taken over the whole cavity. The patient is up and walking around, experiencing no discomfort whatsoever, there is no vertigo nor headache and her equilibrium is perfect.

The radical cavity was dried out daily for seven days, at the end of which time it was perfectly dry and the whole cavity completely epidermatized.

September 9th, twenty days after the original operation, the patient was discharged well, and told to report in ten days, which she did. The cavity was found in the same condition as when last seen.

To-day, four months after the operation, she is in perfect health, with the exception of total deafness of the right ear. There has been no return of the vertigo nor loss of equilibrium.

THE THERAPEUTIC VALUE OF FIBROLYSIN IN OTITIS MEDIA.*

BY ERNST URBANTSCHITSCH, M. D.

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After Hans von Hebra showed in 1892 that thiosinamin is able to cure lupus and to soften pathologic scar tissue, this drug was accepted into our therapy and used to soften scars, at first in a few cases, urethral strictures (Hauc), in chronic inflammatory genital diseases (Latzko), in keloids, fibrous bands following varices, lepromata, syphilomata and lupus, in scleroderma (Juliusberg¹), in adhesions (Lewandowsky²), in valvular insufficiencies following cicatricial changes, rhinoscleroma, Dupuytren's contractions, pyloric and esophageal stricture (Halasz³), glandular tumors (R. Kaufmann⁴), strictures, ankyloses and compressions, in the clearing up of clouded cornea, in synechiae of the iris, and even chronic neuritis and traumatic epilepsy. It was tried also in interstitial diseases of parenchymatous organs (hepatitis, nephritis, orchitis).

Thiosinamin has also been used in otology. Sinclair Tousey⁵ reported in 1897 a case of very severe deafness which was considerably relieved by thiosinamin. Martin Sugar⁶ obtains very satisfactory results by it in otitis media catarrhalis chronica (10 cases). L. Hirschland⁷ used thiosinamin (and later fibrolysin also) in the same disease, as well as in affections of the nose and throat, and was very well satisfied with the results in some cases (the individual cases are not given in detail). These positive results are, however, opposed by negative ones, e. g., those of Bezold⁸ and Vohsen⁹.

The well known reaction of edema and softening of the tissue is at times macroscopically as well as microscopically evident. In a case of rhinopharyngeal lues, the fourth injection of thiosinamin was followed by an increased dyspnea in consequence of a severe swelling of the subglottic space, making a tracheotomy necessary.¹⁰ Glas studied the histologic

*From the Monatschrift für Ohrenheilkunde, XLVI, p. 63.

changes in the scar tissue after treatment with thiosinamin and found that the borders of the individual connective tissue fibres were much less distinct, their contour uncertain, the nuclei widely separated from one another, while the whole band seemed swollen and the fibres were stretched and puffed up.

"Microscopically as well as macroscopically,¹¹ we must consider the action of thiosinamin and fibrolysin as a serous transudation, which loosens up the hard inflammatory bands similarly to Bier's stasis treatment, softens pathologic products and makes them more suitable for resorption."

The reason that this remedy has not been used oftener lies in the fact that thiosinamin must be used by injection into the body, but since it is almost insoluble in water, it must be used in an alcoholic solution, which makes them very painful and therefore not always practicable.

It is, therefore, a very pleasant circumstance that F. Mendel¹² was able to prepare a substance, which he called fibrolysin and which is a double salt, composed of one molecule of thiosinamin and one-half a molecule of sodium salicylate. The important features about its physical properties are its solubility in water and its instability in the presence of light or air. Accordingly, the firm of E. Merck, Darmstadt, have introduced it to the trade in sterile, sealed, brown globules of 2.3 c. c. each (corresponding to 0.2 g. thiosinamin).

Since the beginning of March, 1906, I have made experiments to determine the value of fibrolysin in diseases of the ear. These were carried out in my private practice and at the ear department of the Allgemeine Poliklinik in Vienna (Professor Victor Urbantschitsch). I found, in the great majority of cases, a favorable action, so that I desire in this article to direct attention to the treatment of diseases of the ear by means of fibrolysin.

Since the use of this remedy per os is of so little value that it does not come into consideration, its employment is restricted to injections. These can be made in three ways: intravenous, intramuscular and subcutaneous. The first undoubtedly brings the quickest results, and should, therefore, be used when a very quick action is desired. It must be noted, however, that if the injection is not made in very wide veins, it may cause the formation of a thrombus by injury to the epithelium at the site of the injection. Therefore, only very

wide veins should be chosen, where a thrombus is rare. Since, however, treatment of ear diseases does not, as a rule, demand rapid action, and the whole procedure is a much more subtle one, this kind of injection can usually be disregarded.

The gluteal muscles are supposed to be the best place for intramuscular injection, as they are practically painless. Very few patients, however, permit this, partly on account of the discomfort of disrobing, and partly on psychic reasons. Furthermore this method is not so extraordinarily beneficent that it must be insisted on. There remains, therefore, as the most practical method the subcutaneous injections.

The site of the injection is theoretically of no importance, since the drug acts through the blood current, i. e., in every case is taken up by this and exerts its action from it. Nevertheless, a place near the focus of the disease is usually chosen with the hope that some beneficial local action might be exerted by the drug. For this reason, I made the injections, in the beginning, beneath the skin of the mastoid process, but soon found that the fluid was dissipated very badly in the subcutaneous connective tissue, on account of its poverty of fat. This resulted in a considerable tension of the skin over the fluid (of such amount that a quantity of $\frac{1}{2}$ c. c. causes a swelling such as is found in acute mastoiditis following a perforation of the pus through the mastoid process under the skin) and furthermore it is not easy to introduce here an amount of about 2 c. c. There is also the fact that this place is more exposed and therefore more easily infected if the plaster or collodion used to protect it falls off, and, furthermore, the deformity caused by the injection is very perceptible to one's fellows, to which many patients object. This soon caused me to give up this place and instead to make the injection into the arm, for which purpose the upper arm is better than the lower.

I make the injections usually in the upper arm, alternately on the right and left side, also in the thigh and the back. The sites of the injections are chosen as far apart from each other as possible, as those made near the place of some previous injection are occasionally painful. Of course, the injections are made under the strictest aseptic precautions.

At the first occasion, I inject only a small amount of fibrolysin, about 0.3 c. c., and if this causes no untoward symptoms, the dose is increased subsequently very quickly to 0.6

c. c., then to 1.2 c. c. and finally to an entire capsule of 2.3 c. c. I usually divide the latter dose into one-half for each arm, though most patients can stand the entire amount in one place. After the injection, I massage the place to aid in the absorption of the fluid.

The number of the injections naturally depends on the severity of the case. The average case requires from 20 to 30 injections, given two to three times a week. The indication is a cessation of the improvement, i. e., if I find in the course of the treatment that during twenty injections the hearing steadily if slowly increases, and then fails to do so during the three to five following ones, I usually stop giving them. If after eight to ten injections of the full amount no improvement has resulted, I do not continue them.

A point of special importance is the care of the syringe and needle after each injection. Since light causes fibrolysin to disintegrate into its component parts, the crystals are deposited in the plunger and in the needle, causing both to become brownish. Especially in using of syringes with ground glass or metal plungers which are unyielding and therefore cannot pass over slight inequalities of surfaces, this condition is very unpleasant. Therefore it is necessary to cleanse the needle and syringe after each injection with absolute alcohol. Furthermore, I fill the syringe with absolute alcohol until the next time. If through oversight the syringe or needle should become stopped up, the use of hot or boiling water will sometime remedy this.

It cannot be denied that the injections cause, in addition to the desired action, concomitant symptoms which exert an influence on the treatment, and are more frequent, according to my experiences, than they are reported in literature. These unpleasant complications can be divided into local and general.

The local consist of: (1) When the injection is hypodermic, there is a distinct burning sensation at the site of the injection, which usually, however, is very short ($\frac{1}{2}$ to 5 min.), though it may last several hours; (2) there is a yellowish blue discoloration of the skin around the site of the injection, which not infrequently is of considerable extent and may last for several weeks, gradually clearing up from the periphery to the center; (3) nodules may be formed at the site of the injection which frequently appear only after one to two weeks

and may become the size of a hazel nut. They are almost always painless, and disappear in the course of a few weeks or months. They are caused probably by a part of the fibrolysin being deposited under the skin, and the crystals causing (as a foreign body) an increase in connective tissue.

But the general symptoms which are occasionally caused by fibrolysin are without doubt more important, though they are absent in the majority of cases. The most frequent are more or less pronounced headache, congestion and dullness of the head, and general malaise. These may pass away in the course of a few hours, but in some cases they last a day or longer. In one case there was intense weariness with insomnia. The bodily malaise may be limited to the extremities, usually only one. In one case there was weakness in both feet and hands, in two only in the legs, in one only in the arms, in one only in the right hand, which at the same time was very cold. Nausea, also, was observed once. A very interesting feature of one case was the regular appearance of a menstrual hemorrhage about twelve hours after each injection. This artificial menses resembled the normal in its course and duration (two to three days). For this reason I was finally compelled to discontinue the injections in this case, although they had exerted an unusually favorable influence on the ears. This phenomena was probably due to a hyperemia—in this case in the uterus—and is to be ascribed to an idiosyncrasy. As an analogue, hyperemia appeared elsewhere after each injection, as stated above, in the head, or, especially, in the nose, sometimes causing spontaneous hemorrhages. Perhaps the appearance of severe toothache, observed in one case after each injection, is to be explained by a hyperemia near a carious tooth.

In none of the cases with unpleasant symptoms did I use large doses. They appeared with injections of as small amounts as 0.1—1.0 c. c. It is not improbable that the use of full doses (2.3 c. c.) would not be accompanied by these symptoms, just as e. g., sedatives (veronal, etc.) in small doses excite the patient while large doses have a distinctly quieting effect. In most of the patients, these unpleasant symptoms appear only after the first injection, and do not reappear even after a lapse of several months between two injections, so that a certain tolerance can be acquired for the remedy, at least in this respect.

But just as unpleasant symptoms are manifested in connection with the injection, so also are favorable influences upon the general condition of the body. Many patients feel freer, especially in the head, and the bodily energy seems increased. In one case, there appeared an enormous appetite.

In the fibrolysin-cure, the injection is only one-half of the work. It must always be kept in mind that the action of fibrolysin is to soften and to increase the dilatability of cicatricial tissue. The latter must also be employed. An energetic local treatment must accompany the injection, directed against the chronic middle ear catarrh.

The local therapy consists in inflation, bougiering, vibration and friction—massage of the Eustachian tube, pneumo-massage of the drum, massage of the ossicles by Lucae's pressure probe, massage of the ostium tubae, faradization and galvanization (katalytic action). It is best at each treatment to use some of these, and in some it is best to alternate them somewhat.

As to the choice of cases, in the beginning I used the cure in all kinds of severe deafness, cases of chronic middle ear catarrh, sclerosis, chronic inflammation of the middle ear with a dry perforation, and even labyrinth and nerve affections. This had the advantage of giving a view of the sphere of application of the remedy. To convince myself that the favorable action was actually due to the fibrolysin, I used it in cases which had been treated with the usual methods without results or at least with insufficient results.

My experiences show that the proper field for the use of the fibrolysin is the advanced chronic dry middle ear catarrh, adhesions in the middle ear, and the beginning stages of sclerosis, especially when the hearing is not constantly bad, but has occasional increase in amount. In the severe forms of sclerosis I was unable to accomplish anything objectively, by 10 injections at least, and so discontinued the cure, partially because I considered that in this case there was already an ossification present which could hardly be influenced by a remedy against cicatrization, and partially on account of the restricted amount of fibrolysin at my command, which I could not waste on almost hopeless cases. Furthermore, the cases of disease of the inner ear resulted negatively. I did not, however, use more than 10 injections. I will not assert, nevertheless, that even in such doubtful cases, a longer treatment

would not accomplish an improvement. I saw even the hearing remaining after a *otitis media purulenta chronica antiqua* considerable increased.

Fibrolysin has an occasional undoubted influence on the subjective noises even in those cases where there is no considerable loss of hearing. This is the case when they are due to an irritation or slight compression of the nerve fibrillae of the *acusticus*, which are relieved by fibrolysin. This is analogous to the drug's favorable action in neuralgia. There is relief from tinnitus also in the cases of deafness which are relieved or influenced by fibrolysin. On the other hand, it sometimes happens that the subjective noises remain although the hearing increases, but the favorable action usually affects both. I consider fibrolysin contraindicated in old people with arteriosclerosis on account of its property of causing congestion. It is not advised in active or recently cured *otorrhea*, also, as this can be increased or started up again.

The prognosis at the present can, of course, not be made, even probably. It is to be hoped that deafness caused by disease of the sound conducting apparatus can be considerably relieved.

Fibrolysin, therefore, is a remedy by which we can achieve results not possible in any other way, and its reception into the otologic therapy can be hailed only with joy. However, we must not regard it as a panacea for deafness. Each man must learn the suitable cases, and its proper employment. This article is to help show the correct way and to act as a standard to aid in its employment. Many may find its use harder than it seems.

In order to illustrate better the use and action of fibrolysin, I will report a number of cases treated with it:

CASE 1. Mrs. W., 50 years, very advanced *otitis media catarrhalis* after *otitis media purulenta subacuta*. Hearing for forks and clock 0. Fibrolysin injection (0.2 c. c.) 3/6/06. In the course of the day, there appeared severe headache and staggering gait, causing the patient to fear other injections, which were therefore not continued.

CASE 2. Mr. K., 39, letter carrier. Watch not heard at either ear; very severe tinnitus, left more than right. First fibrolysin injection 3/6/06 (0.5), toothache such as never before. Burning at site injection for three hours. Second injection 3/9 (0.8); severe toothache in afternoon, less tinnitus.

Eighth injection 3/23 (2.0), tinnitus at times less, hearing unchanged. Unfortunately the treatment had to be discontinued on account of private circumstances of the patient.

CASE 3. Mrs. M. W., 46. Sclerosis, very severe bilateral tinnitus, clock 0. First injection 3/7/06 (0.5), followed by decreased tinnitus during the day. After the seventh injection (2.0), the tinnitus remained minimal until the next time (one week later), hearing unchanged. After the eighth, the patient experienced a distinct improvement, since she could plainly hear the rattle of her wagon. The fifteenth injection was made on 6/16. The result was a purer, better hearing for loud sounds, the clock was not heard, and the tinnitus had disappeared on the right side while it was very slight on the left. When the patient presented herself on 6/25/06 and 1/2/07, there had been no decrease in this result.

CASE 4. Mrs. M., 45 years. O. M. C. C., watch right heard ad concham, left not. First injection 3/10/06 (0.8). In the afternoon she had "hot head," which she felt after second and third injections also. On account of severe headache after fourth injection, patient asked to be excused from further injections.

CASE 5. Mr. F. P., 45, laborer. Labyrinth affection. Watch right 0, left 6/150. Rinne positive bilaterally, Weber not lateralized, Meniere's symptom complex. The treatment was desired especially on account of the latter. First injection 3/12 (0.4), second 3/14 (0.8). After the injections, the patient felt much lighter in his head, and, also, remained free from attacks until 3/20, although formerly there were two attacks weekly. On the 3/20, there was a very severe Meniere's attack, which lasted the whole day. For this reason I discontinued the injections.

CASE 6. Miss Th. H., 22. Cat. chron., watch right 6/150, left 6/150. First injection 3/15 (0.9), second 3/19 (1.5). Thereupon headache for two days. Third injection 3/21. An hour later there again appeared a severe headache lasting until the morning of 3/23. For this reason, treatment was stopped.

CASE 7. Miss R. S., 24. Cat. chron. with tinnitus. Watch right ad conch., left 2/150. First injection 3/16/06 (1.0), second 3/18 (1.5), third 3/21 (2.0). Watch, 3/23, right 1/50, left 17/150. Whisper right 6 m., left 1 m. 3/25 watch right 5/150, left 22/150. Eleventh injection 4/18; watch

right 9/150, left 27/150, tinnitus varying, in general better. Sixteenth injection 5/6, watch right 9/150, left 30/150. One hour after first injection, patient experienced bitter taste in whole mouth, apparently also on the lips, then sensation of heat in head, "as in fever" (two hours later), then malaise of the entire body; the arms seemed heavier, the gait was weary, but the tinnitus was distinctly less. These symptoms lasted 2 to 4 hours. Afterwards, the head was much freer, hearing and sight better. The subjective noises at first remained the same, but later became distinctly less. The improvement in hearing and tinnitus continued to the beginning of July, 1906. As the result of catching cold while on a steamer, a relapse occurred. Accordingly, I made on 7/16 an injection of 2.0 c. c. fibrolysin. Two days later, the hearing was again distinctly better. There was a "much freer feeling in the head," the tinnitus decreased to the point of disappearance, and this favorable condition lasted throughout the entire summer until 9/20/06, when the patient had a severe attack of influenza which caused another relapse in the condition of the ear.

CASE 8. Miss L., 26. Cat. chron., with subjective noises (right a tone, left a noise). Watch, right 30/150, left 15/150. First injection 3/27/06 (1.0); eighth on 4/12. Watch, right 45/150, left 40/150. Tenth injection 5/1. Watch, right 56/150, left 24/150. Tinnitus less, the right tone much weaker, and the left noise now two tones, one strong high and one weak, deep tone, which the patient considered much less unpleasant than the previous noise.

CASE 9. Mr. H. H., 50, laborer. Sclerosis. Watch both sides 0; whisper, right 30 cm., left 20 cm. First fibrolysin injection 5/6/06 (0.5); fourth 5/19 (0.6). The treatment had to be discontinued on account of severe weakness of feet, pain in lions and headache after the injections.

CASE 10. Miss F. R., 20. Rinne bilaterally positive, Weber indeterminate. Deep tuning forks not heard, middle and high much shortened. Watch, right 8/150, left 15/150. Whisper, right 230 cm., left 400 cm. Tinnitus. First injection 5/7/06 (0.5). Local burning for one hour, right hand tired and cold. About noon sleepy: slept for a quarter of an hour (never slept before in the afternoon); no headache, but severe, general weariness. For rest of the day entirely well. Second injection 5/9 (0.3). Local burning one-fourth hour, then both arms, especially right "enormously tired;" severe dull

headache in afternoon. Went to bed earlier, slept badly, awoke with slight headache. Left side, tinnitus gone, although it had commenced 6 years before and had been continual for 3 years. Third injection 5/14/06 (0.15). In the morning, headache for 3 hours, malaise. Patient wished to sleep but could not. By 4 p. m. entirely well. Fifth injection 5/18 (0.2). Headache scarcely one-half hour, no malaise, tinnitus less. On 5/19, patient had attack of angina lacunaris, from which she frequently suffered, and which always had taken at least a week for recovery, but which this time left her in 3 days. Ninth injection 5/28 (0.4). Tinnitus distinctly less; patient cannot remember when she felt so well in her ears. Weariness of the feet (following preceding injection into buttock). Eleventh injection 6/1 (0.5). Very tired, trembling of feet, sleepiness with inability to sleep. Patient suddenly called home for family reasons.

CASE 12. Miss M. H. Cat. chron. with tinnitus. First injection 6/1/06 (0.2). Afterwards severe tinnitus for 2 hours, then much less. Headache in afternoon, especially over right eyebrow. Third injection 6/7 (0.4). Tinnitus and hearing better; headache, nausea, vomiting, heavy feeling in abdomen. "Taste of iron in mouth," peculiar feeling in nose. Discontinuance of injections on account of unpleasant concomitant symptoms.

CASE 13. Mrs. L. L., 36, supernumerary in royal opera. In May, 1906, severe deafness followed a bad case of grippe, accompanied by tinnitus left ear. Watch both sides 0. Whisper, right 100 cm.; left 45 cm. Speech, right 360 cm., left 90 cm. Rinne negative bilaterally, Weber indeterminate. First injection 10/15/06 (0.5), no concomitant symptoms. Fifth injection 10/24 (2.0), hearing distinctly better. Patient does not have to pay such strict attention to test, while on the stage understands whispers and piano which has not been possible since May, 1906, in spite of constant treatment. Tinnitus much less, absent for hours at a time (formerly continuous). Eighth injection 10/31 (2.0). Watch, right ad concham, left 0. Whisper, right 100-200 cm., left 60 cm. Speech 800 cm. right, left 200 cm. In the opera house, patient hears piano and piccicato, which she had not heard 14 days before. 2/22/07, watch, right ad concham, left 0. Whisper, right 8 m., left 6 m.

CASE 14. Miss F. C., sister of preceding patient. Two sis-

ters of her mother also deaf. Beginning sclerosis, tinnitus four years, "ringing bells" right, for two years left. Since then continually under treatment, without result. Hearing steadily diminishing. Rinne negative bilaterally. Weber lateralized towards the right. Watch, right 0, left ad concham. Whisper, right 35 cm., left 300 cm. Speech, right 80 cm., left 600 cm. First injection 11/30 (0.5). Fifth 11/12 (2.0). Twenty-third 1/2/07. Watch, right ad concham (?), left 1 cm. Whisper, right 550 cm., left 650 cm. Speech, right 600 cm., left 700 cm. Tinnitus much less.

CASE 15. Miss G. L., 32 years, sclerosis. Watch, right 3/150, left 1/150. First injection 5/22/06 (0.1). Ninth injection 6/19 (1.0). Twelfth 6/30 (2.3). Sixteenth 7/13 (2.3). No special concomitant symptoms. Hearing distinctly better. Watch, right 7/150, left 4/150. The improvement lasted through the summer until 10/9/06. In consequence of severe cold and influenza, a decrease in hearing resulted.

CASE 16. Mr. F. F., architect, 38. Beginning sclerosis. Watch, right 3/150, left 70/150. First injection 10/29/06 (0.5); fifth 11/7 (2.0). Watch, right 10/150, left 100/150. Sixteenth 12/7. Watch, right 20/150, left 80/150. The patient, for years, when walking with a person, could go only on the right side of his companion if he wished to hear what was being said, but now can walk on either side. The improvement in hearing for speech, which is even more distinct than the watch, of course makes his life more pleasant.

CASE 17. Mr. A. B., officer, 42, sclerosis. Watch not heard at either ear. First injection 1/24/07, no unpleasant concomitant symptoms, appetite increased, freer feeling in the head. Ninth injection 2/11; hearing for speech and music distinctly better, for the watch unchanged. The appetite has increased to an amount never known before. Thirteenth injection 2/20; tinnitus, for the first time in years, was absent for several hours, the hearing has increased so much that the patient for the first time since the summer of 1905 could clearly distinguish every voice of a sextette at a musicale. Patient will be treated further.

In each of these cases, the fibrolysin treatment was preceded by several months of local treatment which achieved little or no result. It is especially interesting that in many cases the hearing was very considerably increased for speech, tone and sound, if not for the watch.

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13. This firm kindly sent me gratis a large number of globules for use in the Allgemeine Poliklinik.

ABSTRACTS FROM CURRENT OTOLOGIC, RHINOLOGIC AND LARYNGOLOGIC LITERATURE.

I.—EAR.

A Case of Cerebellar Abscess and Sequestration of the Labyrinth, Due to Chronic Middle Ear Inflammation.

W. SCHUTTER (*Tydschr. v. Geneesk.*, July 28, 1906) saw on February 3, an 18-year-old girl, who had a running right ear for about ten years, which troubled only so far as the hearing was concerned; severe headache with vomiting and dizziness and tendency to fall toward the diseased side had lately appeared, and a week after the commencement of these attacks facial paralysis on the diseased side. Schutter found the surroundings of the right ear normal, bone not painful on pressure, Romberg with tendency to fall toward the right; the visual field turned toward the right, movements of the eyes and pupils normal, pulse 85, the external ear canal filled with granulations and pus. Admitted to the hospital two days later. Entire examination negative, temperature 38. Patient is deaf for speech; tuning-fork examination unreliable. The facial paralysis may be due to a lesion in the labyrinth or in the tympanum; the headache, dizziness and vomitus could also be due to labyrinthitis. Radical operation (February 19); nothing particular was found, especially no fistulae; first dressing after six days for slight elevation of temperature; thereafter every other day; appetite, general appearance, good. March 6, sixteen days after the operation, patient began to complain of headache. Increase of intermittent headache, mostly in the forehead, sometimes in the back. She screamed with pain, was dizzy with the sensation of falling out of the bed towards the diseased side, nausea, sometimes vomiting and slight delirium. When she lay down after having set up a while, she said she got a short, severe pain in forehead and occiput. No pain of the skull on percussion, but paresis of the right abducens and speech defect; dysarthria without any trouble in the motion of the tongue or other articulatory muscles; in both eyes neuroretinitis hemorrhagica; no convulsions. For one day the pulse was 60, otherwise no diminished frequency. On March 11 a lax paresis of the right arm, also ataxia of the right leg,

but less pronounced than of the right arm. The tendon and skin reflexes were normal, as well as the sensibility and localization for dermal stimuli. The only result of tuning-fork examination is that C is heard osteo-tympanally somewhat shorter on the right side than the left. A complication in the posterior part of the cranial cavity is most probable, as the hemiparesis, ataxia and dysarthria point to it; most probably there is a cerebellar abscess, as no symptoms of meningitis are present. Operation on March 12: tegmen tympani and antrum carefully looked over again, no fistula visible, then the genu superius of the sigmoid sinus and a part of its vertical part was uncovered; sinus looked normal and pulsates, medially the dura looks normal but does not pulsate; on further exploration the posterior wall of the antrum is found sequestered, with the sequestrum touching the dura. Puncture here revealed a somewhat muddy fluid, but no pus; tamponade with iodoform gauze. For a few days patient felt better, but then the headache returned now constantly in the forehead with dizziness and vomiting. One day there was severe neuralgia in the collateral trigeminus and sometimes spasms appeared on that side of the face. Fetid discharge was found in the tympanum on changing the dressing (March 16). That same day trepanation was performed over the right temporal lobe; the dura did not pulsate, looked normal; a probe 3 to 4 cm. deep into the cerebral mass freed some serous fluid, after which the dura pulsates. The cerebellum was again punctured and fetid pus drawn out of the abscess; opening was enlarged and a drain put in, through which a large quantity of pus is discharged. Pulse before operation 100, after 80. It did not do patient much good; headache and vomiting persist. Exitus on March 31st. The dysarthria and right abducens paresis had increased during the last days, the knee reflex became abolished while the plantar reflex remained; autopsy showed dura adherent to the posterior surface of the temporal bone around the fistula. Toward the cerebellar abscess, nearly the entire hemisphere changed into an abscess and the inferior horn of the right cerebral ventricle enlarged, and in the os petrosum a large loose sequestrum containing the vestibulum with the semicircular canals and a part of the cochlea.

The dysarthria as a cerebellar symptom is fully in accordance with Bolk and Jelgersma. Bolk localizes the coördi-

nated movements of the muscles of the head and neck in the anterior part of the middle portion of the cerebellum, on evolutionary data; while Jelgersma found in cases of cerebellar atrophy with dysarthria the cerebro-cerebellar tract on both sides injured. Jelgersma showed that these parts (Bolk) belong to a cerebro-cerebellar tract, which can be demonstrated through the whole series of mammals and the development of which goes equally with the power of continual finer differentiated coördinated movements of the muscles of the head, a differentiation which reaches its highest point in the movements of speech and mimicry in men. An apparent exception is made by a focus in the pons, but this must be very near the raphe and enough extended to affect both the tracts.

The dysarthria in this case was due to a monolateral but very extensive abscess in the direct neighborhood of the vermis, the sagittal dimension of which was a good 3.5 cm. The possibility of double interruption of the cerebro-cerebellar tracts seems therefore very acceptable, and an encephalitic malacia around the abscess of the left hemisphere in the neighborhood of the abscess is probable, although without microscopical change.

Blaauw.

The Itard-Cholewa Symptom and Its Detection in Cases of Sclerosis Aurium.

H. ZWAARDEMAKER (*Tydschr. v. Geneesk.*, July 28, 1906) includes the cases which the Germans consider to depend upon primary osteitis of the labyrinth capsule and those which result from a dry chronic middle ear catarrh. Even if one accepts the original pathologic-anatomic distinction, a differential diagnosis will be only possible in the later stages. And even here it is uncertain. Not only diagnostically, but also etiologically, these two conditions meet (family disposition, parasymphilitic and paratuberculous predisposition, influence of catching cold and trauma). They form one clinical picture, which can be taken as an entity for therapeutic purposes. Acoustically a disappearance of the bass side of the scale is found (Bezold); outspoken paracusis Willisiana; at first increase, later small decrease of the upper limit (only for the Galton whistle of Koenig). The writer adds a new symptom, the tactile insensibility of the drum for air motions en masse. It is easily shown by examining all cases with a tuning-fork of 32 vibrations. With sufficiently large movements, which pro-

duce considerable amplitude of vibrations, the observer notices a peculiar vibration in the region of the drum, which is the more striking as the sound is not more heard. The sufferer with sclerosis lacks this sensation when the whispering voice is heard at less than two meters. This phenomenon is identical with the symptom of anesthesia of the drum described by Itard and Cholewa. This is more positive as it is generally combined with lessened sensitiveness of tragus pressure and penetration of air on catheterization. It may be connected with dryness and scaling of the skin of the external auditory canal, so often described.

This same symptom is also found in extensive cicatrices of the drum and in hysteria. Sufferers with labyrinthitis and with neuritis acustica feel the vibration of the drum very well by motion en masse, even if the acoustic acuity is far less than whisper at two meters.

STRUYCKEN divided sclerosis patients into two groups: those with diminished sensibility of drum, auditory canal and auricle and those with normal sensibility. He found the minimum limit of vibrations for contact as sensitive perception about 1 micron, while this went down to 5 to 6 micron in a number of cases.

Blaauw.

The After-Treatment of the Radical Operation.

A. C. H. MOLL (*Tydsch. v. Geneesk.*, July 28, 1906) mentions the importance of the after-treatment in preventing recurrences. In the beginning the aim was to keep the form of the operation cavity as perfect as possible; continued tamponing was necessary, which, however, irritated, so that often epidermization followed only after much scraping and cauterizing. This made many surgeons desist from tamponing. Moll thinks everything is in favor of leaving the wound quiet. If the operation has made a septic wound, then after removal of the first bandage the cavity will be filled with sanguinous serous fluid with bactericidal properties. Piffel examined this fluid and found that in the succeeding dressings the strepto-, staphylo-, and diplococci decreased in number and virulence and ceased to act pyogenic. If the wound cavity is protected against infection from without, if the granulations are not irritated, then the cavity becomes slowly smaller and takes the form of the external ear duct with an enlargement deeply inward, through addition of the attic and prominence of the promontorium. However, sometimes we must stimulate e. g. with tincture of iodine

or cauterize with chromium or nitrate of silver. As a rule, after the first bandage the evacuation of the secretion has only to be looked after by a moist piece of gauze lying at the bottom of the ear canal, which is in contact with the dressing which fills the external ear. This opening is enlarged at the operation, but no plastic, no flap is made. He therefore makes two parallel incisions from within outwardly in the posterior wall of the membranous ear canal before opening the antrum and cuts this skin flap at the concha. This is the method of Zaufal. Many French surgeons remove the membranous posterior wall entirely, which facilitates the after-treatment very much, enlarges the cavity, and especially with children. Moll makes the upward incision according to Siebenmann, through the ear canal outwardly as far as the rima helicis through skin and cartilage, dissects the skin loose, clips the cartilage away with a downward and forward curve and lays the loosened skin over this cartilage defect behind, through which the deep parts come into sight. The wound behind the ear is closed; the cavity tamponed, which fixes the flap of Siebenmann at the same time. After removal of the first dressing no more tamponing. Where there is much secretion, daily change of dressings.

Many cases undoubtedly will remain where tamponing will be necessary, in general where for some reason the retro-auricular opening is not closed primarily. But whenever this is possible a reduction of the cavity should be tried and the healing process as little as possible be disturbed. He has not seen any unpleasant stenosis; he remembers two children operated years ago where the ear canal remained very ample. He mentions a case operated without removal of the membranous posterior wall in a child where repeated stenosis occurred which only stopped with removal of the posterior wall. Moll removes this wall now from principle, as this skin possesses mostly small vitality and the flap is in the way more or less for the after-treatment. Also during the operation itself, especially in children, a larger cavity has its advantage. He never found the hearing suffered with this method.

Blaauw.

A Case of Post-scarlatinous Bilateral Osteomyelitis of the Temporal Bone, with Sequestration of a Part of the Left Labyrinth.

P. TH. L. KAN (*Tydsch. v. Geneesk.*, July 28, 1906) operated radically on a girl of 3 years who, during an attack of scarlatina,

acquired a double otorrhea, and eleven weeks later an abscess behind both ears. Nearly the entire mastoid process on the right side was removed in four loose sequestra; dura mater and sinus became bare after the operation and facial paralysis appeared, later relieved. On the left side the entire mastoid process was found movable, surrounded with pus. The mastoid process formed with a part of the lateral wall of the facial canal and the largest part of the horizontal semicircular canal one large sequestrum, which could be removed. The facial nerve remained intact. The hearing acuity could not be taken with the young child. During the healing the child learned to walk, and no disturbances could be noticed in the movements. The child now walks normally.

Report of Three Cases of Infective Sinus Thrombosis.

RICHARDS, New York (*Archives of Otolaryngology*, vol. xxxvi., No. 4). Case 1. A woman was stricken with la grippe and three days later a left acute otitis media developed, with mastoid pain. She became profoundly septic and on operation the antrum contained a few granulations, but no pus. The sinus was exposed and opened. From the torcular end a free flow occurred, but from the bulb end of the sinus there was no flow whatever. The wound was packed and a jugular resection done. Upon returning to the mastoid wound to remove the clot from the deep limb of the sinus, when the gauze packing over the lower end of the opened vessel was withdrawn, a recent thrombus was extruded and this was followed by a profuse gush of blood from the bulb. On the following day there was another rigor, but from this time on convalescence was uninterrupted.

Case 2. A middle-aged woman, who five weeks previously had a right acute otitis media purulenta, with mastoid tenderness and labyrinthine disturbance.

The middle ear inflammation abated, but the labyrinthine symptoms became greatly aggravated, with repeated vomiting, disturbed equilibrium and intense high-pitched tinnitus.

On operation no pus was found in the mastoid, but there were numerous necrotic areas scattered throughout the bone. The stapes had disappeared and the oval window was the seat of a fistula. The patient's condition improved to such an extent that she was allowed to return home. She was suddenly seized with a chill and, on account of inability to otherwise account for this condition, the vertical sinus limb

was opened and found to contain a purulent clot which extended into the bulb. On resecting the jugular the vein and its tributaries were so generally thrombosed that no clamping of vessels was necessary. The vein was cut off behind the clavicle and a curette passed far downward into the thoracic portion of the vessel, but no return flow was established. In a few days the patient succumbed to general sepsis.

Case 3. A child aged 11, with a long-standing suppuration of the left middle ear, developed mastoid tenderness, became delirious and had an irregularly high temperature. The neck in the upper jugular region was tender and decidedly stiff. There was no vomiting, no incoordination and the equilibrium was good.

On operation the antrum was found filled with thin fetid pus, there was an epidural abscess over the middle of the vertical sinus limb and a dark red clot with purulent foci extended from the knee of the sinus into the bulb.

After operation the horizontal nystagmus, which had persisted up to that time, ceased, and the further history of the case was uneventful.

Campbell.

The Demonstration of Disturbances of Equilibrium in One-Sided Disease of the Labyrinth.

KROTOSCHINER, Breslau (*Archives of Otology*, Vol. xxxvi., No. 4). The most reliable tests for making a diagnosis of one-sided disturbance of the labyrinth are as follows:

1. Hearing tests. It should be determined whether on the diseased side forks from a' down are not perceived (Bezold), and the Lucae-Dennert test should be applied.

2. Static examination on a horizontal plane. The patients stand on the right leg, on the left leg and on their toes with closed eyes. The trunk is bent to the right, to the left, forward and backward.

3. Dynamic examination (walking and jumping). The disturbances of equilibrium are most evident usually on jumping backward with eyes closed.

4. In examination with the goniometer the degree of inclination which is supported with the eyes closed is always distinctly less than when the eyes are open.

5. Centrifuging:

- (a) Active: Where the patient turns ten times to the

right about his own axis, and then to the left, with open and with closed eyes.

(b) Passive: Where a rotating disk five feet in diameter is employed. Five rotations are made, each taking five seconds. If the centrifuge is suddenly stopped there is a sensation of counter-rotation which persists for a few seconds. According to von Stein, in a normal person there is no counter-rotation.

Campbell.

Herpetic Inflammations of the Geniculate Ganglion.—A New Syndrome and Its Aural Complications.

HUNT, New York (*Archives of Otolaryngology*, Vol. xxxvi., No. 4). The syndrome is dependent upon a specific herpetic inflammation of the geniculate ganglion, situated on the facial nerve in the depths of the internal auditory canal, in the entrance to the aqueduct of Fallopius, and its expression is found in herpes of the tympanum, auditory canal, the concha, tragus and antitragus. Because of its proximity to the facial nerve and the terminations of the auditory nerve neural complications are not infrequent; peripheral facial palsy, tinnitus aurium, deafness and symptoms of Ménière's disease.

Campbell.

A Case of Serous Meningo-Encephalitis, with Autopsy Report.

BLAU, Goerlitz (*Archives of Otolaryngology*, Vol. xxxvi., No. 4). A child aged $2\frac{3}{4}$ years was taken ill with measles and three weeks later a right acute suppurative otitis media developed, with anorexia, malaise, gradual loss of eyesight and hearing, left-sided ptosis and convulsions in the left arm and the left leg.

Three weeks later the author found the child somnolent, emaciated, with reflexes absent and abdomen retracted. The left pupil was dilated and irresponsive. The right Mt. was almost completely gone, and the tympanum was granular and contained fetid pus.

The antrum was opened and its mucous membrane found swollen and granular. The middle fossa was exposed and the dura found tense and congested. The brain was punctured in three directions without finding any pus, though a large quantity of clear fluid was evacuated on each insertion of the knife. Exposure of the sigmoid sinus and posterior fossa gave the same result.

On autopsy the longitudinal sinus contained coagulated

blood. The pia was transparent and its vessels very thin. the convolutions were unusually flattened. Both lateral ventricles were enormously dilated and the thalami and the corpora striata flattened. There was much watery fluid.

Campbell.

Another Case of Otitic Purulent Sinus Thrombosis without Fever.

SCHROEDER, Erlangen (*Archives of Otology*, Vol. xxxvi., No. 4). A man, aged 49, five months before coming under observation had a left otitis media suppurativa with mastoid pain, which still persists.

On examination the canal was found filled with fetid pus, the upper wall depressed, the right red and bulging and edema and tenderness over the mastoid. The pus contained staphylococci.

On operation the antrum contained pus. When the sinus was exposed it was found covered with discolored granulations and pus exuded from the sinus through an opening large enough to admit a thumb. The whole course of the disease was afebrile. The sinus wound was packed with gauze and the clot above and below left undisturbed. *Campbell.*

Report of a Case of Diphtheria, Complicated by Acute Purulent Otitis Media, Mastoiditis and Infective Sinus Thrombosis.

KERRISON, New York (*Archives of Otology*, Vol. xxxvi., No. 4). A woman aged 19, suffering from diphtheria, had a temperature varying from 98° F. to 104.8° F. On the sixth day a paracentesis of the right Mt. was done because of redness and bulging. Mastoiditis developed and the antrum and mastoid cells from tip to zygoma were explored. The vertical limb of the sigmoid sinus was exposed for about five-eighths of an inch, but it appeared normal. For eight days following this operation the temperature was normal, then there was an abrupt rise to 105° F. An examination of the wound revealed a pus pocket, which was freely drained; still the patient became progressively more septic. The sinus was exposed from knee to bulb, opened, and while there was free bleeding from above there was none from below. A curette dislodged a well-organized clot about one-third of an inch long. The jugular vein was excised and recovery thereafter was uneventful. *Campbell.*

Otitic Meningitis.

ARNOLD KNAPP, New York (*Archives of Otolaryngology*, Vol. xxxvi., No. 4). Recently it has been shown that uncomplicated otitic meningitis occurs as often after acute as after chronic purulent otitis. The meninges are first infected, in nearly three-fourths of the cases, in the posterior cranial fossa and in slightly over one-fourth of the cases in the middle cranial fossa.

Heine suggests the classification of purulent meningitis into encapsulated, acute progressive and general. No single symptom is characteristic. Kernig's sign is perhaps the most constant. Lumbar puncture is a great aid. Until recent years the prognosis was most unfavorable. Then cases were reported as cured by elimination of the primary focus and by repeated lumbar puncture.

Campbell.

II.—NOSE.**Concerning the Bleeding Polypi of the Nasal Septum.**

JORGEN MOLLER (*Archiv. für Laryngologie und Rhinologie*, Bd. xx, Heft 1, 1907). The first to describe these peculiar tumors was Lange. Schadowaldt first gave them the name of bleeding polypi of the septum.

These growths, in the large majority of the cases, occur in women, and in many cases there appears to be a distinct connection between pregnancy and the development of such growths. In an interesting case reported by Wright, the growth recurred several times after removal from the nose of a pregnant woman. In another year, when the patient was again pregnant, the growth developed again and recurred after removal. It finally disappeared spontaneously after the woman was confined.

Traumatism is given as an etiological factor by some writers (Freudenthal and Glas), while Glas also thinks that rhinitis anterior sicca is an important cause.

He made an accurate histologic examination in ten cases, and in seven was able to determine the presence of rhinitis anterior sicca.

The author reports two typical cases of this interesting condition. In both cases there was a distinct relationship to pregnancy.

Theisen.

Contribution to the Treatment of the Purulent Inflammation of the Frontal Sinus.

H. J. L. STRUYCKEN (*Tydschr. v. Geneesk.*, July 28, 1906) makes, under local or chlorethyl anesthesia, an incision of 1-2 to 3-4 cm. below the inner upper margin of the orbit under the brow through the skin as far as the bone, not longer than 1 cm., and pushes away the periosteum with one of the small raspator-*na* of Killian. In the incision a self-retaining retractor is inserted and the inferior wall of the frontal sinus is perforated with Doyen's burr (1-2 cm. diameter) in the direction of the middle of the horizontal brow-line. Most of the hemorrhage stops when the refractor is put in place, sometimes adrenalin tampons are necessary, or a few artery forceps. Only a branch of the supratrochlear nerve has to be cut. When the bone-opening is large enough the membrane in view is carefully examined, and if the wall of the cavity is filled with pus it is easily perforated with the blunt probe. The pus flows out and the cavity is probed. When the bony wall is intact, the cavity is syringed with Anel's syringe, taking care that the fluid can escape at the side of the canule; or the pus can be sucked with Bier's suction bag, or both methods may be combined in different positions of the head. In acute and subacute cases the frontal headache, fever, etc., disappear immediately and the patient is cured without further effort. In chronic cases, where the nasofrontal duct is more or less obstructed, the anterior part of the middle turbinate is first resected, polyps, etc., removed. Complicating empyema of the antrum, primary or secondary, is relieved by way of the nose or alveolar process. The ethmoidal cells, if affected, are attacked endonasally. While syringing the nasofrontal duct is seen to be well open during the first few days, but later the fluid escapes along the external opening. As a rule in chronic cases one must syringe for a long time; to make it easy and painless a small drainage tube is put in or a tight wound silver spiral 1 cm. in length. They must be constructed so that they keep themselves in the wound and can be easily closed. It is remarkable how, with regular irrigation twice to four times a day with some warm non-irritating fluid, the condition in the nose changes, how not only the secretion of the frontal cavity changes its nature, but also the fetid character of the ethmoid secretion disappears and the purulent secretion diminishes. Marked hyperplastic mu-

cous membrane in the frontal sinus retrogrades within a few weeks. In one case a very fetid chronic multiple empyema of years' standing was cured after four weeks with a hardly perceptible cicatrix. However, one must be careful not to declare the condition cured too soon; the wound might need reopening, which then can easily be done with the pointed probe of Weber.

This method can not entirely replace the radical one, but it may be tried first; in any case it makes conditions more favorable and has undoubtedly great use. *Blaauw.*

Hypertrophic Nasal Catarrh and Complications with Clinical Illustrations.

BUCKLIN, New York (*Archives of Otolaryngology*, Vol. xxxvi., No. 4). The author claims that the vacuum formed within the entire respiratory tract with each forcible nasal inspiration amounts in cases of patients suffering from hypertrophic rhinitis to 1-3600 pounds to the square inch, and with the obstruction reduced one-half the amount of oxygen inspired is doubled.

He demonstrates these atmospheric relations by means of his "respirometer," a glass tube four feet long with an one-eighth inch bore. One end of this tube is placed in a glass of water, the other end is held air-tight in the patient's mouth, while he takes a long, rapid, forcible inspiration through the nose. The height to which the water is raised in the tube determines how great a vacuum the patient forms in the respiratory tract with each forcible inspiration. Each nostril is closed in turn, and it will be seen that inspiration through the more occluded nostril will cause the water to rise higher in the tube. *Campbell.*

An Epidemic Pneumococcic Catarrhal Disease.

BECK AND STOKES (*Journal of the American Medical Association*, September 14, 1907). A description of a curious catarrhal condition of an epidemic nature occurring in Dr. Beck's practice in Baltimore.

It differed essentially from ordinary colds in that it was apparently not the result of exposure and it affected almost invariably more than one member in a family, and sometimes entire families.

The cases may be looked on clinically as measles without a rash, as conjunctivitis with general catarrhal symptoms, as whooping cough without a whoop or as grippe without men-

tal or physical depression. The group of cases presented a definite clinical picture, and the authors considered that the epidemic is an affection having a distinct entity.

The paper is based on the study of fifty-six cases, of which thirty-three were examined bacteriologically.

The histories of a few of the most typical family groups are given:

Group 1. G. family, consisting of six members—father, mother and four children. The children were aged 18, 6 and 5 years and 10 months, respectively. The author was called to see the baby, who was thought to be suffering from whooping cough. The child had had none of the acute infectious diseases. The one boy, aged 5 years, was the first one in the family affected with this catarrhal condition. The others, except the other boy, were affected three days later. The attacks were ushered in with chills, followed by slight fever and night sweats; this was associated with paroxysmal cough, discharge from the nose, watering of the eyes, slight soreness in the throat, slight pain in chest and abdomen and absolute loss of appetite. There was marked constipation and vomiting frequently occurred after paroxysms of coughing. The cough was of a severe character. The attacks occurred more frequently during the night.

When the child was first seen the symptoms had subsided, except the cough and the discharge from the nose, which was then muco-purulent. He had a slight bronchitis and vesicles of chickenpox.

The one son, aged 6 years, who was similarly affected was also taken with chills and fever, which were followed by sweats. He had peculiar dry, paroxysmal cough, having three or four severe attacks at night, which lasted until he vomited. He had marked lachrymation, without congestion, nasal discharge, sore throat, thoracic and abdominal pains but no rash. The fever lasted about one week, during which he had several night sweats.

The daughter, aged 18 years, and the mother had the same train of symptoms, namely, fever, sweat, cough, sneezing, rhinitis, mild conjunctivitis, pain in the chest, slight abdominal cramps, anorexia and vomiting after coughing. The symptoms lasted three weeks. The father had the same symptoms, but a more intense conjunctivitis.

The baby began with intestinal symptoms, nausea, vomit-

ing and diarrhea. She had a muco-purulent conjunctivitis in both eyes, slight swelling of the eyelids and intense photophobia. The throat was uniformly red, but the tonsils were not enlarged. Cover-slip preparations and cultures from the nose and throat of the mother and baby showed pneumococci.

Group 2. S. family. Four members were affected—aunt, aged 35 years; mother, aged 40 years, and two children, aged 5 and 7 years. Mrs. M. and her sister, living in a flat on the second floor of the same dwelling, were also affected. The symptoms in this group of cases were about the same as in Group 1.

One of the most interesting cases of this collection was treated in the Baltimore Eye, Ear and Throat Hospital.

The patient, a boy aged 18 months, had had early symptoms of hoarseness, cough, fever and lassitude. Several brothers and sisters were affected in the same way and some of them had a rash. The eye symptoms had existed a week before he was admitted to the hospital. There was cloudiness of the cornea of the right eye and a hazy appearance of the cornea of the left eye. The mucous membrane of the mouth and throat was reddened and there was a slight, dirty looking membrane which appeared in patches in the pharynx. Cultures proved negative for diphtheria, but bacteriologic examination of the eyes showed almost pure pneumococci.

Etiology.—That this disease is of an infectious nature is evident from the report of the two family groups. Forty-six cases occurred in nineteen families.

An interesting example of the epidemic character is an outbreak on board a bay steamer, in which 20 per cent of the crew suffered the same symptoms, including the captain, chief engineer and watchman. A smear from the engineer's throat showed epithelial cells containing as many as sixty pairs of encapsulated diplococci.

In all except ten of the authors' cases there was a history of house infection.

Age.—The disease is met with more frequently in children. In twenty-two of the fifty-six cases it occurred under 7 years of age, ten of these under 1 year, the youngest patients being twins 8 weeks old.

All of the authors' cases occurred in the spring.

Symptomatology.—The period of incubation ranges from two to seven days.

The invasion is usually marked by chilliness, slight febrile disturbances, and occasionally night sweats. Temperature usually from 99.5 F. to 102 F., continues from three to four days to one week.

A spasmodic cough, croupy in character, usually worse at night and often associated with nausea and vomiting is a fairly constant feature.

Profuse herpetic eruptions frequently occur. Loss of appetite and often complete anorexia are distressing symptoms in young children. A striking feature in the study of these cases is the absence of any marked nervous or mental symptoms.

A decided leucocytosis was observed in all cases in which the blood was examined.

A significant feature of this disease is the formation of a pseudo-membrane. This occurred in 12.5 per cent of all the cases. The membrane is of a light yellow color, usually situated in the nose, pharynx or naso-pharynx, and occasionally the conjunctiva.

Cover-slip preparations show an enormous amount of encapsulated pneumococci, and direct inoculation with animals produces pneumococci septicemia. Severe bronchitis was present in ten of the cases. Some of them, which had been carefully studied, proved almost beyond a doubt to be due to a pneumococcus infection.

Fibrinous pleurisy complicated two cases, and frontal sinusitis and purulent otitis media each complicated one case.

Bacteriologic study.—In most of the cases the diplococcus pneumoniae, at times in combination with the pyogenic micrococci, was found.

The first cases of pneumococcic conjunctivitis were reported by Parinaud and Morax, in 1894, and the cases were also accompanied by lachrymation, coryza and purulent and fibrinous inflammation of the conjunctival mucous membrane.

So far the writers have studied 33 cases, and found pus cells and pneumococci in 7 specimens from the nose, 9 from the throat and 10 from the eye. The pneumococcus was found in cultures in 8 cases from the nose and in 23 cases from the throat and in 4 of which membranes were present.

The original cultures from most of the cases were inoculated into white mice, and the pneumococci often proved virulent, killing the mice with general septicemia in from 1 to 11 days. In the second series of 16 cases, 8 rabbits were

inoculated intravenously with pure cultures from the throats and 5 died of general pneumococci septicemia. In 29 out of 33 cases the pneumococcus was obtained either from the nose, throat or eye by cover-slip cultures or animal experiments.

Conclusions.—This disease exists as a distinct entity characterized by purulent or fibrinous inflammation of the mucous membranes of the eye, nose and throat.

The infection can be communicated from diseased to healthy persons.

The infection is caused by the pneumococcus, resembling in its cultural and pathogenic properties the cause of lobar pneumonia.

Theisen.

III. — MISCELLANEOUS.

A Pebble in the Left Superlobar Bronchus, Extracted With Help of Inferior Bronchoscopy.

DR. P. TH. L. KAN (*Tydschr. v. Geneesk.*, Aug. 25, 1906) was called June 25th, 1906, to see a child of nearly 3 years, which had swallowed a pebble on the previous day while playing; symptoms of severe suffocation were present. According to the physician the pebble was loose, but could not be removed. There was first slight dyspnea and some hours later such a severe attack of dyspnea, that they feared he would choke, but before tracheotomy could be performed the oppression ceased spontaneously. Examination directly after the first and second attack showed the respiratory sounds over the left superior lobe practically absent; no other changes. No shadow with a Roentgenograph. On account of the age and nature of the foreign body, superior bronchoscopy was inadvisable; as the trachea of a child of 2 years has a diameter of 7 to 8 m. m., which necessitates the thinnest tube of Killian (7 m. m.), which is still too big to be moved in the bronchus. Therefore Dr. Pastoors performed tracheotomy. Careful palpation with a probe distinctly revealed a hard foreign body in the left main bronchus at a distance of 5.5 c. m. from the inferior angle of the tracheal wound and the probe went downward in certain directions without touching the body. Kan concluded from this that the pebble was tight in one of the branches of the chief bronchus and projected partly in this. This branch was in all probability the bronchus of the superior lobe, as the respiratory sounds were absent here. The shortest and thinnest bronchoscope of Killian could only with dif-

ficulty be pushed as far as the bifurcation, although the mucous membrane had been cocainized and the tube rubbed with sterilized oil. A small wall of mucous membrane was pushed up. It was impossible to see clearly into the chief bronchus and detect the pebble. Dilatation did not give a sufficient result. Then the nose speculum of Hartmann with very small and long branches was introduced; as it was 3.5 c. m. long it would remain at a distance of 2 c. m. from the foreign body, but this speculum somewhat stretched the trachea. The pebble now was seen and a repeated examination showed that there was considerable room between the pebble and the medial wall of the bronchus. A thin blunt sound was bent 2 to 3 mm. at right angle from the end, while a similar bending was made at the other end as a guide. The child was deeply narcotized, with hanging head; after a few trials the extraction succeeded. The entire operation, inclusive of the tracheotomy, lasted a full hour. The pebble had an oval form, was yellow, 1 cm. long, 7 mm. broad, 5 mm. thick.

In this case the diameter of the trachea was exceptionally small, probably smaller than the left main bronchus; perhaps the bronchi are more dilatable, having less cartilage than the trachea.

After extraction, a tracheal canule was introduced; during the night the respiration became difficult and in the morning the child seemed in danger of dying; oxygen inhalations improved things somewhat, but only the removal of dry, sticky mucus from the trachea after removal of the tube and dry crusts of mucus deep in the trachea improved the respiration; the child could then expectorate. The tracheal wound now was closed; continuous steaming in the neighborhood of the child, entire recovery.

Blaauw.

The Treatment of Stuttering.

W. POSTHUMUS MEYES (*Tydschr. v. Geneesk.*, July 28, 1906) mentions that psychical influence has its significance in heredity, and that stuttering and backwardness together with adenoids suggest degeneration. At present four methods are used: 1. The classical method of Gutzmann, conscious exercising of respiratory, speech and articulatory muscles toward one harmonic coöperation. 2 The method of Liebmann, the

suggestive or psychologic method; he combats chiefly the fear of speaking; only one person at the time is treated. Slowly self-confidence returns. 3. The method of Chervin, unjustly called after his pupil Berquand, enforces silence outside of the lessons, so that the impulse for spasmodic, extra movements of the face is suppressed. All three methods need five to six weeks for a cure, with constant control to prevent recurrence. 4. The combined whispering and respiratory method takes some principles from each of the three preceding ones.

As the *causa morbi* is so often a different one, no single method can be called the only true one. The chief point of the treatment is a good instructor, who succeeds in getting the pupils under his personal influence. Every disturbance of normal nose breathing must be treated. Stammerers can be benefited with extra instruction in speaking after the usual school hours. Stutterers are to be taken to a special institution where they are taught how to speak in addition to the usual instruction. *Blaauw.*

Neurologic Observations Regarding Stuttering.

PROF. K. HEILBRONNER (*Tydschr. v. Geneesk.*, July 28, 1906) states that the acquired stuttering conditions which the neurologist sees belong to different groups: 1. The aphasic stuttering (Pick, etc.); nearly related thereto, different forms of speech-disturbance following epileptic fit, permanent (Fuerstner) or transitory. 2. Those forms which develop from mutism, the post-traumatic stuttering. Heilbronner sees an analogy in this last form where stuttering starts suddenly after a fright; nearly related thereto is congenital imitation. Analogous to the first mentioned form, he considers the cases lately described, and also observed by himself, where facial-lingual pareses exist dependent upon a circumscribed cerebral disturbance. Some cases of left-handedness with stuttering belong to this group also. Chorea is closely related to this form. A lesion in the motoric apparatus somewhere must be sought for as the cause of the first group of stuttering; for the second group the lesion must lie outside of this apparatus. Etiologically a separation might be made between congenital disturbances dependent on local conditions, upon heredity or intrauterine lesions (hypoplasias, as Pfister explains enuresis), and general disturbances, which produce diminished strength and thus a predisposition to all

possible psychical derangements. One must also think of the possibility of postpartum lesions (encephalitis). Prognostically it must be considered whether or not many obstinate cases of stuttering in non-neuropathic persons are due to such focal affections.

Therapeutically the method of education by conscious physiological speech is alone rational when a disturbance of the motor apparatus is found. For the psychogenous group this method has in reality the significance of a suggestive remedy. The success of the other methods shows that the suggestion is the principal factor. The stuttering treatment is a therapeutical question, which ought to be regulated by the physician. He has to decide if local changes need treatment. The eventually necessary exercise treatment, which must be individual and not schematic, may be left to the pedagogue.

Blaauw.

Speech Motions of Stutterers.

F. H. QUIX (*Tydsch. v. Geneesk.*, July 28, 1906) examined several stutterers with Zwaardemaker's instrument for registering the speech motions. The following are registered: 1. the movements of the lower jaw; 2, the motions of the upper lip; 3, of the lower lip; 4, the movements of the muscles of the floor of the mouth. Together the time is registered and, if desired, the respiration. The curves must be compared with those of normal persons. The curves of normal persons are always uniform at a certain position of the instrument for the same word. The height as well as the succession of the curves, depend upon the intensity and the velocity of the diction and of the accent. There is always a constant connection between the moments of beginning of the motion of the different muscle groups. In the pause all muscles rest, only with accidental swallowing, the curve of the floor of the mouth shows a pretty steep elevation. The curves of stutterers show that one or more muscle groups do not rest between the pronunciation of words. Often in all muscle groups involuntary contractions appear, sometimes also only in some. Only in a few cases were these movements absent; they were generally strongly represented.

The muscular movements on pronunciation of a word show various departures from the normal type, which, however, may be found often in stutterers. The simplest case is that in which the stuttering spoken word shows a repetition of the

strokes in the curve. The size of the different strokes may greatly differ. The size gradually increases till at the end the right strokes appear. The curves become more complicated when the strokes of one muscle group increase and those of others decrease. Gradually a curve-image forms, where one muscle group makes repeated contractions in trying to pronounce a word, while one or more, the contraction of which is also necessary for that same word, remain quiet. With such a speech-motion the word can not appear before the mutually correct coördination is brought about.

In a normal curve the contractions of the different muscle groups begin at mutually constant times; with the stutterer, often one or more muscle groups move while the others remain behind. This must interfere with the normal explosion. Different anomalies are often mixed.

The speech motions of stutterers are characterized by: 1, contractions in the pauses between the speaking of words; 2, repetition of the typical contractions of the different muscle groups, with varying intensity; 3, variability of the moments of beginning of the contractions of the different rating muscle groups; 4, variability of the mutual relations of the intensity of these contractions. A coördination disturbance is suspected, and Quix thinks that the cause must be looked for centrally in the motor-speech center. It is a question if these anomalies are found in all stutterers; a more extensive investigation is therefore necessary. *Blaauw.*

Tracheal Diphtheria with Recurring Formation of Pseudo-Membrane.

H. HERZOG (*Deutsche Medicinische Wochenschrift*, No. 20, 1907). The author had occasion to observe three times in a severe case of diphtheria "ecouvillonnage" of the larynx.

In 1896 Variot and Bayeux described, under the term "ecouvillonnage," a new procedure in the treatment of laryngeal diphtheria.

The method consists in the passing of the tube, just as in the ordinary intubation. The tube, which loosens the membrane clinging to the walls of the larynx and trachea, is removed in a few minutes and the detached membrane is coughed out.

In the following case described by the author the patient coughed out the tube with a membranous cast of the trachea three times.

J. B., aged $23\frac{1}{4}$ years. Had measles four weeks before coming under the author's observation. Coryza and a hoarse cough for a week, with suffocative attacks for several nights. On examination an extensive membrane was observed on both tonsils. The nose was clear. Intubation was performed within a half hour after the patient was admitted to the hospital.

The tube could be easily introduced, but was coughed out after a few seconds, covered with a membrane which covered it like the finger of a glove.

The membrane showed the impressions of the tracheal rings.

Ten hours after the first intubation urgent symptoms demanded a second one.

The tube was again coughed out at once, and was covered with the same kind of membrane.

Fourteen hours later another intubation had to be performed, and the same thing happened. The same tube-like membrane was coughed out.

The further history of the case is of no great interest. The patient made a complete recovery.

The use of antitoxin did not prevent the regeneration of the membrane in the trachea, which occurred twice in twenty-five hours, but the ease with which the membrane was thrown out was undoubtedly due to the action of the serum.

Theisen.

BOOK REVIEWS.

A Text-Book of Diseases of the Nose and Throat.

By D. BRADEN KYLE, A. M., M. D., Professor of Laryngology and Rhinology, Jefferson Medical College; Consulting Laryngologist, Rhinologist and Otologist, St. Agnes Hospital; Fellow of the American Laryngological Association, etc. With 219 illustrations, 26 of them in colors. Fourth edition, thoroughly revised and enlarged. W. B. Saunders Company, Philadelphia and London. Price, \$4.00.

The appearance of the fourth edition of Kyle's textbook emphasizes the position which it has held since the first edition was presented. The general plan is the same, but it has been greatly amplified in the revision.

The following new topics have been added:

Taking cold, atrophic rhinitis, chemic ulcers, fibromyxoma of the nasopharynx, glioma of the nose, telangiectoma, syphilis of the septum, empyema of the antrum in the young, bone-cysts of the accessory sinus, rhinopharyngitis mutilans, gangrene of the tonsil, actinomyces of the tonsil, glandular pharyngitis lateralis, Vincent's angina, angina ulcerosa benigna, cyanotic pharyngitis, angioneurotic edema, pharyngeal aneurysm cough, purpura hemorrhagica, congenital stridor, scleroma of the larynx, bronchoscopy; voice, speech, defects of speech and relation of voice to hearing, functional aphonia and surgery of the larynx.

In the following chapters alterations and additions have been made: Simple, acute rhinitis; phlegmonous rhinitis; occupation rhinitis; simple chronic rhinitis; emphysema of the face, nasal obstruction and the importance of nasal breathing; ozena, atrophic rhinitis; nasal hydrorrhea; nasal syphilis; lupus; nasal neuroses; asthma; epidemic influenza; headache; neuralgia; erythema; epistaxis; tumors; fibroma of the larynx; lipoma of the tonsil; carcinoma of the larynx; sarcoma of the nose, fauces, pillars and soft palate; adenocarcinoma; cysts; deformities of the septum; tumors of the septum; angioma of the septum; depression of nasal cartilage; diseases of the accessory sinus; empyema of the sphenoidal and frontal sinuses; relation pathologic conditions of the nose, and accessory sinus to the eye; systemic nasopharyngitis; simple chronic nasopharyngitis; adhesions of the soft palate to the pharyngeal wall; diseases of the tonsils; diseases of the pharynx; hyperplastic change in the pharyngeal structure; rheumatic pharyngitis; syphilis of the pharynx; retropharyngeal abscess; pharyngomycosis; foreign bodies in the pharynx;

malformations and deformities of the larynx, edematous laryngitis; hyperplastic laryngitis; singer's nodules; syphilis of the larynx; tuberculosis of the larynx; prolapse of the laryngeal ventricle; hysterical aphonia; and laryngectomy.

The author details his well-known views on sialosemiology from the standpoint of the diagnostic value of saliva. The significance of the bacteria of the nose also receives attention.

In considering the various diseases of the nose and throat a most successful attempt is made to classify them in a logical way. As an example showing the character of this effort, the classification of acute rhinitis may be instanced, as follows:

I. Simple acute rhinitis.

a. Acute rhinitis in constitutional conditions.

1. Measles.
2. Pertussis, or whooping-cough.
3. Scarlet fever.
4. Smallpox.
5. Typhoid fever.
6. Rheumatism.
7. Diabetes mellitus.
8. Diphtheria.
9. Erysipelas.
10. Scorbutic rhinitis.
11. Anemic rhinitis.
12. Scrofulous rhinitis (strumous).
13. Caseous rhinitis.
14. Epidemic influenza.
15. Lithemic rhinitis.

b. In the young.

II. Membranous rhinitis.

1. Croupous or pseudomembranous.
2. Fibrinoplastic.
3. Diphtheritic (see diphtheria).
- c. Occupation rhinitis (traumatic).
- d. Hyperesthetic rhinitis (hay fever).
- e. Ulcerative rhinitis.
- f. Edematous rhinitis (acute edema).
- g. Phlegmonous rhinitis.

In like manner, all the conditions of the nose and throat are taken up and described in a logical, clear and painstaking way.

The typography is particularly commendable, the illustra-

tions well selected and clear, and the general index is far superior to what is found in most books.

Tracheo-Bronchoscopy, Esóphagoscopy and Gastroscopy.

By CHEVALIER JACKSON, M. D., Laryngologist to the Western Pennsylvania Hospital, the Eye and Ear Hospital and the Montefiore Hospital. With five colored plates and many illustrations. The Laryngoscope Co., St. Louis. Price, \$4.00.

Jackson has been so closely associated with the progress of our knowledge of the direct inspection of the larynx, trachea, bronchi, esophagus, and stomach, that the publication of his work will be accepted as its authoritative expression. That this is justified is easy to ascertain by a study of his book.

It differs materially from the monographs of Gottstein and Schroetter, which are more exhaustive in the discussion of the individual topics but less clear and comprehensive.

He describes and pictures the various head lamps that may be used, such as Kirstein's and Guisez's, and, in turn, the examination and operative instruments of Mosher, Mikulicz, Rosenheim, von Hacker, Starck, Killian, von Schrötter, Einhorn, Ingals, Coolidge. The instruments which the author devised are described in detail. Those intended for examination differ from Killian's in that they carry a small lamp in the tube for the purpose of illumination, doing away entirely with the cumbersome head lamp.

The illustrations showing diagrammatically the position of the patient, assistant operator, etc., are particularly happy, and make the method exceedingly clear. A full discussion of foreign bodies in the trachea and bronchi make this part of the work most important, and the cases reported add greatly to the knowledge of the subject.

Esophagoscopy is considered under the following heads: Anatomy, normal esophagoscopic appearances, technic of esophagoscopy, diseases and anomalies of the esophagus, stenotic diseases of the esophagus, non-stenotic diseases of the esophagus, foreign bodies in the esophagus. Attention is called to the esophagoscopic appearance of these different conditions, whether or not relief is to be obtained by the use of the esophagoscope. The esophagus is thus brought within the sphere of local examination, whatever the conditions be presented, and diagnosis becomes more largely a matter of direct inspection.

Under the head of gastroscopy the author gives a short

history, presenting pictures of the older instruments, such as the polyscope of Trouve and the gastroscope of Mikulicz and Rosenheim. Of these Mikulicz determined that a gastroscope must be rigid, but he gave it a bend, while Rosenheim, who asserted that it should be straight, at times failed to introduce it without a bend. To these points the author adds four more, which he considers requisite for proper gastroscopy:

1. Optic apparatus must be abandoned.
2. The tube must be passed by sight.
3. The stomach must be examined in a collapsed state to permit of mopping, palpation with the instrument, probing and combined endoscopy, and external palpation.
4. General anesthesia is indispensable to prevent retching, during which the diaphragm clamps the tube, rendering exploration impossible.

The technic of gastroscopy is fully described, considerably amplified beyond what was originally given when his paper first appeared in the *Fränkel Festschrift* number of the *ANNALS* (December, 1906). It is clear that the author was correct when he stated in this paper that the usefulness of gastroscopy would soon be generally recognized.

A complete summary of the literature (358 references) is given.

The book concludes with five well-made colored plates, showing sixty-eight different views. The whole work is a most creditable exhibition of the rapid and consistent development which has been taking place in laryngology in America during the past twenty years.

A Manual of Diseases of the Nose, Throat and Ear.

By E. BALDWIN GLEASON, M. D., Clinical Professor of Otology at the Medico-Chirurgical College, Philadelphia. 12 mo. of 556 pages, profusely illustrated. W. B. Saunders Company, Philadelphia and London. Flexible leather. Price, \$2.50, net.

This very convenient little volume contains a short, well-expressed treatise on the subject, suitable for students and general practitioners. No attempt is made to be exhaustive, and yet the ground is well covered.

The Labyrinth of Animals.

By ALBERT A. GRAY, M. D. (Glas.), F. R. S. E. Vol. I. J. S. Churchill, London, 1907. P. Blackiston's Son & Company. \$8.40.

The author gives us in this beautiful volume the result of seven years' work upon the labyrinth of vertebrates. The work is of special value to the comparative anatomist and

student of evolution, and the chapter on the significance of anatomic differences in the labyrinths of animals is of unusual interest.

The volume at hand includes the primates, cheiroptera, carnivora, ungulata, edentata and most of the rodentia. The second volume will deal with the rest of the rodents, the insectivora, the cetacea, the sirenia, the marsupialia, the monotremata, as well as the birds, reptiles and amphibia. Fishes have been omitted as having been completely described by Retzius and other anatomists.

For the instruction of the laboratory worker exact directions are given as to the method of making the preparations and of taking the photographs. Briefly, the labyrinth is injected as soon as possible after death, through the oval window with a 5-10 per cent formalin solution. Following this alcohol, ether, colloidin and xyol and paraffin are used during several weeks, and finally the bone surrounding the labyrinth is decalcified and removed and the latter photographed stereoscopically. The photographed labyrinth when viewed through the small stereoscope which accompanies the book stands out as if made of spun glass.

Some idea of the great value of the book may be had when we remember that the photographs of semicircular canal, vestibule, ampulla, cochlea, etc., are exact representations of the originals, each one in its proper relation to the others and therefore of much greater worth than the opposite pictures made from sections, etc., which adorn the pages of the ordinary anatomical atlas. This is particularly true of the membranous labyrinth. It is also not improbable that the investigation of the pathological changes which cause deafness, tinnitus, etc., made possible by the author's preparation method, may be productive of results of therapeutic value. *Campbell.*

The Principles and Practice of Modern Otology.

By JOHN F. BARNHILL, M. D., and ERNEST DEWOLFE WALES, B. S., M. D. 575 pages and 305 illustrations. W. B. Saunders Company, Philadelphia and London.

This is a composite book intended for the use of students and practitioners of general medicine, the anatomy, bacteriology, physiology, and pathology of which is by Dr. Wales and the balance of the book by Dr. Barnhill. The authors have

had in view "To modernize the subject of otology; to correct certain traditional beliefs which have hindered the progress of otology; to advocate the earliest prophylaxis and treatment; to emphasize the importance of a thorough examination and definite diagnosis as a basis for rational treatment and to thoroughly illustrate the subject by suitable pictures."

A point of view similar in the main actuates every author who produces a work of any value. The ideals mentioned have been largely attained and the book here noticed has a right to the title, "Modern Otology."

Dr. Wales has had the hardest though the briefest part of the whole, and if he seems to the reviewer to have failed in any way it is because of the difficulties of the subject and the inability to treat it clearly in the space allowed him. The section on the bony anatomy while rich in pictures is vague in description. A new nomenclature is applied to the semicircular canals, namely, the superior cerebral posterior cerebellar and the tympano-mastoid semicircular canals, a nomenclature much inferior to that now used in Germany, namely, anterior vertical, posterior vertical, and horizontal semicircular canals. The description of the cochlea occupies but thirty lines, and no mention is made of the auditory nerve filaments and their termination. The illustrations are good and really illustrate, but clearness in the descriptive anatomy seems to have been sacrificed in order to save space. Most of the chapter on physiology is a translation from Denker's "Die Otosklerose" and gives the sound wave theories of Helmholtz. The bacteriology is described clearly but briefly, and the characteristics of the different bacteria are well analyzed, but the chapter ends with the somewhat startling statement that while the bacteriology of the ear is interesting from a scientific point of view, it is from a practical point of view one of the least important aids in the diagnosis of aural diseases and their complications. With this opinion many aural surgeons will not be in accord.

The chapters written by Dr. Barnhill are clear and concise, and the style is pleasing. The methods of treatment given are those which he has personally found useful, others are for the most part omitted. For the beginner in otology this is excellent and saves much confusion of mind. The illustrations really illustrate the text and are all new. The chapters on

catheterization and on adenectomy are good examples of the clearness of description and of illustration.

In the chapter on acute tubotympanic catarrh the term paracentesis has for the most part been dropped and the term incision of the tympanic membrane been substituted therefor. This change should become universal in aural literature.

The entire subject of mastoid surgery and its complications is most admirably handled, the indications and counter indications for the various procedures being clearly and accurately stated. One point is particularly well brought out in the chapter on the radical operation, namely, the possible danger to the facial nerve when using a protector, on account of the thinness of the upper wall of the Fallopian canal where it forms part of the floor of the aditus ad antrum. The indications and technique for the operation of suturing the facial nerve to the spinal accessory or the hypoglossal is described and a most excellent illustration serves to make it clear.

There is a chapter on the practical relation of suppuration and necrosis to life insurance. The difficult and discouraging subject of non-suppurative otitis media in its various forms is well handled, though there is nothing new in the methods of treatment advocated, those only being given which have stood the test of time. Particular consideration has been given to the things one ought not to do. The surgery of the labyrinth is briefly considered, but detailed methods of diagnosis and treatment are omitted; the subject is doubtless too new for description in a text book. Much more work has yet to be done in this department of aural surgery. There is an excellent chapter on deaf mutism. By a system of cross references much repetition has been avoided and the volume made more useful for reference.

Taken as a whole the volume reflects great credit on its authors and also on American otology, and it can be most heartily commended, not only to the student and general practitioner, but to the aural surgeon as well.

The pictures are remarkably clear for half-tones and show great care in the printing. Many of the illustrations are colored and throughout the book the anatomic plates really illustrate the text and are more than mere pictures.

Richards.

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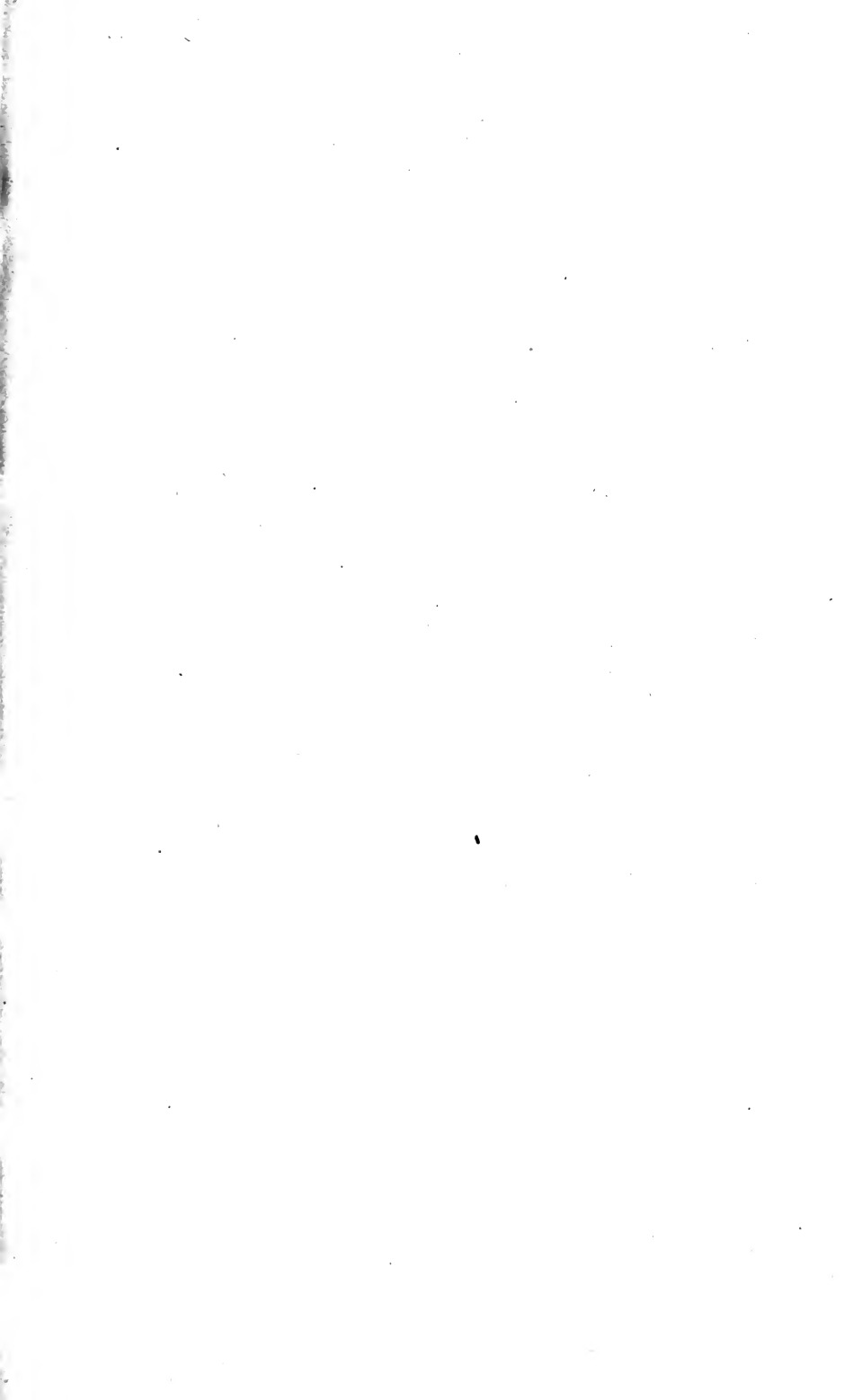
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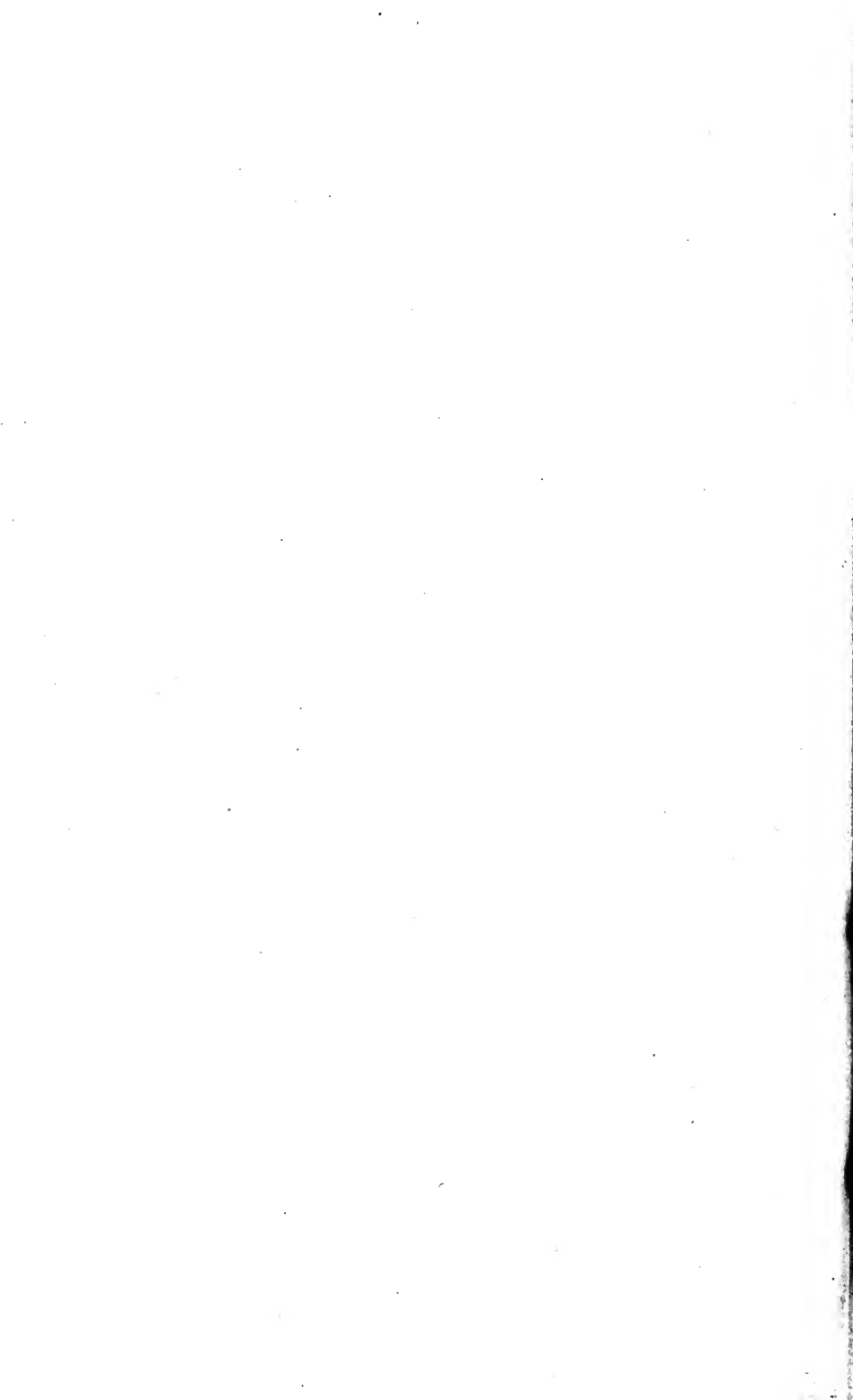
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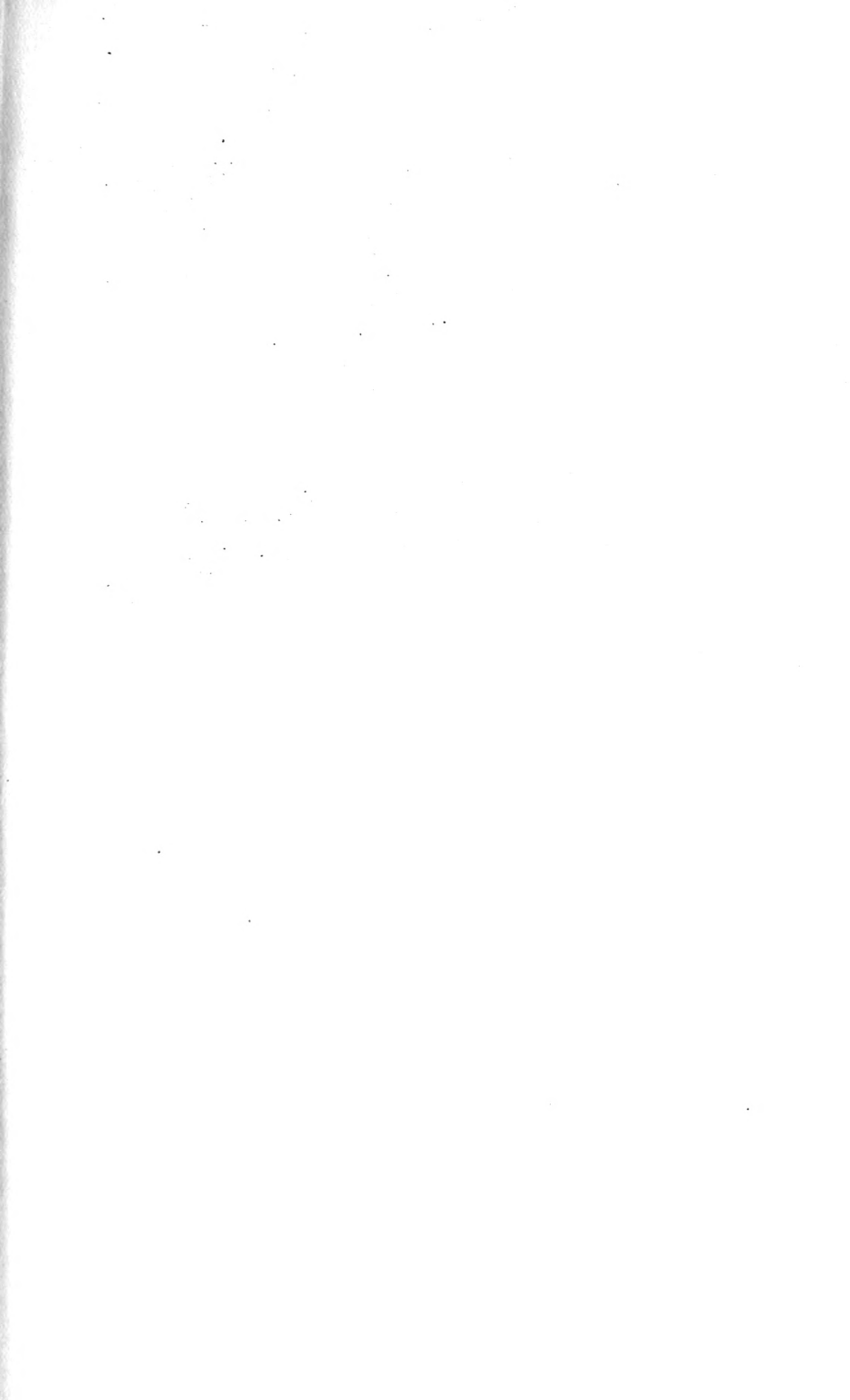
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